5140.609
(T68)
2
no. 6

W. F. Turner

TENNESSEE
STATE BOARD OF ENTOMOLOGY

SIXTH ANNUAL REPORT

OF THE

STATE ENTOMOLOGIST AND PLANT PATHOLOGIST FOR 1910

AUG 8 1944

KNOXVILLE, TENNESSEE
1911

Natural History Survey
Library

Tennessee State Board of Entomology

John Thompson, Commissioner of Agriculture..............*Chairman*
Nashville

G. M. Bentley, State Entomologist and Plant Pathologist,
Secretary, Knoxville

All communications should be addressed to the

State Board of Entomology,
Care of University of Tennessee,
Knoxville, Tenn.

Sixth Annual Report of the State Entomologist and Plant Pathologist for 1910

KNOXVILLE, TENN., December 31, 1910.

To His Excellency, Malcolm R. Patterson, Governor of Tennessee:

SIR: I have the honor to submit herewith the Sixth Annual Report of the State Entomologist and Plant Pathologist, in compliance with the requirements of law.

The year just closed has been characterized by a decided extension of the duties of the Board, which may be enumerated under the following heads: Efforts to prevent the introduction into the State of dangerous insect pests and plant diseases; to check the spread of injurious forms of pests from place to place within the State; to investigate the habits and natures of injurious insect and plant diseases and prescribe remedies for their prevention and control; to publish and distribute literature, giving instruction in methods of combating and preventing insect enemies and plant diseases; to answer letters of inquiry about insects and their injuries; to demonstrate the making and applying of spray solutions; and to give information on spray machinery.

The fact that Tennessee is annually sustaining a large financial loss from the depredations of injurious insects and plant diseases on its farm, garden and fruit crops is being realized by the agricultural population and sincere efforts are being made to prevent this needless waste. Realizing that most of the failures in agricultural and horticultural pursuits are traceable to the inability of growers to recognize either the presence or attacks of dangerous pests, the Board has, through county correspondence, public demonstrations and correspondence from the office, been a means of extending information relative to the dangerous forms and how best to combat them in a practical way.

The following report discusses the work done during the year in the nursery inspection, which requires three months during the summer and about one month during the winter. The nursery interests in the State are rapidly improving both in extent of acreage and the methods of growing stock. There are at present 242 nurseries receiving an annual inspection. Many of these nurseries import seedling stock for propagation purposes, and because of the importation of the brown-tail moth in these foreign shipments, careful inspections have to be made upon receipt of these infested importations.

Through the horticultural and nurserymen's associations, which annually meet in Nashville for a two-days' session, both the planter and the grower of fruit trees have become more closely associated and the fruit-growing interests have been greatly fostered. The program for this year's meetings follows in this report.

Warning is given regarding an extensive outbreak of the seventeen-year locust, which is to appear in all of Western Tennessee and a greater portion of Middle Tennessee in the spring of 1911. This warning is both timely and important, and if heeded will be of great advantage to the orchardists in those sections of the State.

Attention is called to the new national insecticide law which goes into effect January 1, 1911. For all users of poisons for combating insect pests and plant diseases this is a most important law, providing, as it does, that a guarantee shall be placed upon all packages or containers whatsoever of insecticides and fungicides.

Emphasis is placed upon the necessity of a careful orchard survey in Tennessee. The Board should be in close touch with the orchardists of the State, the varieties of fruits grown, the methods of cultivation and care practiced, in order that it can the better give assistance best suited for the particular locality and timely recommendations as to the kind of spray material and the time for using it for controlling dangerous insect pests and plant diseases.

Public orchard demonstrations have been conducted in many sections of the State with gratifying success, acquainting as it has many of the larger growers with the duties of the Board and serving as a source from which information regarding the care and protection of farm, garden and fruit crops may be obtained. Through these demonstrations many have adopted spraying practices to a great saving and a material increase of their products.

The remainder of the report is devoted to the habits and methods of control of several insects which are generally destructive in the State and concerning which much correspondence has been received during the past year.

In conclusion, under the head of appropriation needed, are enumerated a few of the more urgent needs of the Board, in order to continue its present work and expand into new lines of greater usefulness to the horticultural and agricultural interests of the State.

The real need and great importance of the work done by the State Board of Entomology are evident from the correspondence coming from all parts of the State asking for information. In like manner, the under-developed fruit interests of the State demand attention for their development. Therefore, in the interest of truckers, florists, fruit growers and farmers of the State, it is respectfully suggested that the Legislature of 1911 be requested to increase the annual appropriation of the Board so that its present work can be carried on and the urgent problems facing the horticultural and agricultural interests in Tennessee may be investigated.

ELIGIBLE TENNESSEE NURSERYMEN.

The following nurserymen have had their nurseries inspected and have received State certificates permitting them to sell nursery stock till August 1, 1911. There are at present 242 eligible nurserymen in the State. During the past year nine nurseries have discontinued business but the total acreage devoted to nursery growing has been increased by 197 acres. Tennessee is now one of the leading nursery States of the South. Stock from its nurseries is shipped not only to all parts of the United States and Canada, but to most of the foreign countries. The nursery business may be classed as one of the leading assets to the State.

(Number following name indicates rural delivery route.)

Name and Address.	*Size.*	*Stock Grown.*
BLOUNT COUNTY		
MARYVILLE		
Chas. R. Coulter	Small	Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
BRADLEY COUNTY		
Cleveland		
Easterly Nursery Co	Medium	Fruit, Shade and Ornamentals
Fletcher & Harrison Nurseries	Medium	Fruit
L. K. Dickey, 2620 Church Street	Small	Berry Plants
CANNON COUNTY		
Mechanicsville		
Mechanicsville Nurseries, Dr. John Jones	Small	Fruit and Strawberry Plants
Woodbury		
Comer & Womack	Small	Fruit
CARROLL COUNTY		
McKenzie		
John M. Null	Small	Fruit and Strawberry Plants
Vale		
George Mizell	Small	Fruit
CHESTER COUNTY		
Enville		
H. D. Woodward	Small	Fruit
Henderson		
F. M. Oneal	Small	Fruit
COFFEE COUNTY		
Tullahoma		
Tullahoma Nursery	Medium	Fruit and Strawberry Plants
J. C. Hale Nursery Co., J. C. Hale	Small	Fruit
CROCKETT COUNTY		
Bells		
A. Vestal	Small	Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
F. P. Grant	Small	Strawberry Plants
J. R. Kenner	Small	Strawberry Plants
Fruitvale		
J. K. Dunlap	Small	Strawberry Plants
N. V. Williams	Small	Strawberry Plants
Gadsden		
D. O. Casey	Small	Strawberry Plants

DAVIDSON COUNTY

Hermitage		
P. M. Carver	Small	Fruit
Linton		
W. J. Smith	Small	Fruit
Nashville		
Belmont College Greenhouses	Small	Greenhouse
J. T. Dawson	Small	Greenhouse
Geny Bros	Large	Greenhouse
L. Haury & Son	Medium	Greenhouse
Joy Floral Co	Large	Greenhouse and Ornamentals
Lischy Nursery & Greenhouses	Medium	Greenhouse and Ornamentals
MacIntyre Bros	Medium	Greenhouse
E. M. Patterson	Small	Fruit
Arnold Schmid	Small	Greenhouse
D. A. Tibbs, 6	Small	Fruit
E. Roach, 16th Ave	Small	Ornamentals

DeKALB COUNTY

Smithville		
Keltonburg Nursery, C. A. Cantrell, 2	Medium	Fruit
Mammoth Nursery, Young Bros., 5	Small	Fruit

Name and Address.	*Size.*	*Stock Grown.*
Blue Spring Nursery, Smith & Son, 5	Small	Fruit
Home Nursery Co., Hicks & Cantrell	Small	Fruit
Ideal Nurseries, Loring & Underwood, 5	Small	Fruit
Mount Hope Nursery, Moss & Allen, 1	Small	Fruit
Mountain Nursery, B. G. Sanders, 1	Small	Fruit
Pistle & Hopper, 5	Small	Fruit
New Fruit Nursery Co., W. H. Davis, 5	Medium	Fruit
People's Nursery Co., Van Hooser, Flanders & Cantrell, 5	Small	Fruit
Cave Spring Nursery, Clark & Denby, 6	Small	Fruit
Cumberland Mountain Nursery Co., 5	Medium	Fruit and Ornamentals
W. J. Griffith	Small	Fruit
Oak Hill Nursery Co., W. H. Davis & O. R. Delong, 2	Small	Fruit
R. M. Sanders, 1	Small	Fruit
Bluhm Nursery Co., Gilbreath & Co., 6	Small	Fruit
Prosperity Nursery, Redman Bros., 2	Small	Fruit
Pure Fountain Nurseries, F. R. Sanders, 1	Medium	Fruit and Ornamentals
Smithville Nursery Co., Moore & Hicks, 2	Medium	Fruit
Wharton Springs Nursery, 1	Small	Fruit
J. P. Tittsworth & Sons, 2	Small	Fruit and Strawberry Plants
Center Grove Nursery Co.	Small	Fruit
D. W. Griffith	Small	Fruit

Name and Address.	*Size.*	*Stock Grown.*
Union Nursery Co., Bing & Co., 5	Medium	Fruit and Strawberry Plants
Lone Oak Nursery, J. A. Griffith, 1	Small	Fruit
Seven Springs Nursery Co., 9	Small	Fruit
L. O. Bing, 5	Small	Fruit
J. M. Cantrell, 1	Small	Fruit
Big Four Nursery Co., L. P. Potter & Sons	Small	Fruit
Mountain Nursery, Taylor Bros. & Cantrell, 1	Small	Fruit
Choice Fruit Nursery, E. O. Underhill, 6	Small	Fruit

DICKSON COUNTY

Dickson

Mrs. M. E. Curry	Small	Greenhouse
Miss J. S. Moize	Small	Greenhouse
J. A. Higdon	Small	Fruit

Sylvia

Barton's Creek Nursery, Byrns & Nesbitt, 1	Medium	Fruit

White Bluffs

Pleasant Ridge Nursery, J. L. Farriest	Small	Fruit

FRANKLIN COUNTY

Decherd

Will F. Halladay	Small	Strawberry Plants and Grapes

Estill Springs

W. W. Britton	Small	Grapes

Winchester

Southern Nursery Co	Large	Fruit and Ornamentals
Tennessee Wholesale Nurseries	Large	Fruit

Name and Address.	*Size.*	*Stock Grown.*
Commercial Nursery Co., 2	Medium	Fruit and Ornamentals
Glenn Cliff Nursery, 2	Medium	Fruit and Ornamentals
Cumberland Nurseries	Small	Fruit
Planter's Pride Nurseries	Small	Fruit and Strawberry Plants
Lily Grove Nursery Co	Small	Fruit and Strawberry Plants
Joe Shadow Nursery Co	Small	Fruit
Fairview Nursery Co	Small	Fruit
Cedar Hill Nursery Co	Medium	Fruit and Ornamentals

GIBSON COUNTY

Gibson

L. S. Landrom	Small	Strawberry Plants
D. A. Ramsey	Small	Strawberry Plants
Zeb. V. Russell	Small	Strawberry Plants
W. R. Thornton	Small	Strawberry Plants
D. C. Warmath	Small	Strawberry Plants
J. A. Dungan	Small	Strawberry Plants

Humboldt

J. M. Blakemore	Small	Strawberry Plants
L. R. Duffey	Small	Strawberry Plants
Gibson County Nurseries, W. W. Baird	Small	Fruit
W. H. Hamilton	Small	Strawberry Plants
H. J. Hegler, 8	Small	Strawberry Plants
R. J. W. Matthews	Small	Strawberry Plants
T. N. Nelson	Small	Strawberry Plants
W. Z. Raines & Son	Large	Strawberry Plants
H. S. Stallings	Medium	Strawberry Plants
Mrs. J. F. Russell	Small	Greenhouse
Chester Penn	Small	Strawberry Plants
Ben Hazelwood	Small	Strawberry Plants
J. S. Stallings	Medium	Strawberry Plants
Tennessee Nursery Co., W. W. Baird	Small	Fruit
H. H. Love, 5	Small	Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
M. F. Hamilton, 5	Small	Strawberry Plants
M. J. Hamilton, 1	Small	Strawberry Plants
H. M. Hamilton	Small	Strawberry Plants
Sunny South Nursery Co., Robert Fizer	Small	Fruit
J. P. Simmons, 8	Small	Strawberry Plants
Mrs. Ben Hazelwood	Small	Strawberry Plants
Mrs. C. A. Dungan	Small	Strawberry Plants
J. H. Hopper, 11	Small	Strawberry Plants
MEDINA		
W. R. Caruthers	Small	Strawberry Plants
Hardy Fly	Small	Strawberry Plants
W. P. Cole	Small	Strawberry Plants
J. B. Roe	Small	Strawberry Plants
Ed. Rowlett	Small	Strawberry Plants
Wilson Graves	Small	Strawberry Plants
RUTHERFORD		
Rutherford Nursery, C. Pennington	Small	Scions

GILES COUNTY

LYNNVILLE		
Lynnville Nurseries, M. L. Spivey, 4	Small	Fruit and Strawberry Plants
PROSPECT STATION		
Woodlawn Nursery, R. A. Eubank	Small	Fruit
PULASKI		
Lamar Nursery Co., R. O. Lamar	Medium	Fruit and Ornamentals

GRAINGER COUNTY

WASHBURN		
Oak Hill Nursery, A. L. Hopson	Small	Fruit

Name and Address.	*Size.*	*Stock Grown.*
HAMILTON COUNTY		
CHATTANOOGA		
Chattanooga Nursery Co., D. W. Hunter	Medium	Fruit and Ornamentals
John Karsten	Medium	Greenhouse and Ornamentals
John Sanders	Small	Strawberry Plants
EAST CHATTANOOGA		
W. H. Montgomery	Small	Grapes and Berries
John Lightfoot	Medium	Strawberry Plants
H. Lightfoot	Medium	Strawberry Plants
HILL CITY		
W. F. Haegar	Medium	Greenhouse and Ornamentals
HIXSON		
John E. Folkner	Small	Strawberry Plants
U. S. Messick	Small	Strawberry Plants
E. E. Swingle	Small	Strawberry Plants
Ashley Bros	Small	Strawberry Plants
Joseph Kirklen	Small	Strawberry Plants
Will Kirklen	Small	Strawberry Plants
Kirklen & Clayton	Small	Strawberry Plants
MISSIONARY RIDGE		
Mrs. J. W. Crouch	Medium	Greenhouse
SALE CREEK		
Will List	Medium	Strawberry Plants
List & Brown, 1	Small	Strawberry Plants
List & Iles, 1	Small	Strawberry Plants
David B. Wallace	Small	Strawberry Plants
SODDY		
A. Horn, 3	Large	Strawberry Plants
R. B. Wilcox, 3	Small	Strawberry Plants
ST. ELMO (Chattanooga)		
C. O. Hunt	Small	Greenhouse
HARDEMAN COUNTY		
GRAND JUNCTION		
J. W. Gregory	Medium	Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
HICKORY VALLEY		
Mrs. R. A. McAnulty	Small	Greenhouse
HENDERSON COUNTY		
LEXINGTON		
J. A. Young, 1	Small	Fruit
HENRY COUNTY		
MANSFIELD		
Mansfield Nursery Co	Small	Fruit
KNOX COUNTY		
BEARDEN		
Peter's Nursery Co., R. E. Gettys	Medium	Ornamentals
FOUNTAIN CITY		
Chas. Baum	Medium	Greenhouse
Fountain City Fruit Farm	Small	Strawberry Plants and Grapes
O. H. Tindell, 2	Small	Fruit and Ornamentals
HEISKELL		
Lone Oak Nursery, A. J. McClain	Small	Fruit and Strawberry Plants
KNOXVILLE		
Knoxville Nursery Co	Large	Fruit and Ornamentals
Standard Nursery Co	Small	Fruit and Ornamentals
C. W. Crouch	Large	Greenhouse
A. H. Dailey	Medium	Greenhouse and Ornamentals
C. M. Emory	Small	Greenhouse
Howell Nurseries	Medium	Ornamentals
William Jenkins	Small	Grapes
A. J. McNutt	Small	Violets
Marble City Nursery Co., 6	Medium	Fruit and Ornamentals
East Tennessee & Mississippi Orchard Co	Small	Fruit and Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
Pickel		
Thos. C. Schnicke	Small	Fruit
Powell Station		
James N. Hendrix, 2	Small	Fruit and Strawberry Plants
R. H. Hendrix, 2	Small	Fruit and Strawberry Plants
Home Nursery Co., S. Dougherty	Small	Fruit
W. J. McElroy	Small	Fruit and Strawberry Plants
LAWRENCE COUNTY		
Crestview		
Summertown Nursery, J. H. Green	Small	Fruit
Fallriver		
Fallriver Nursery, L. H. Garretson	Small	Fruit
Pleasant Point		
W. O. Musgrove	Small	Fruit
LINCOLN COUNTY		
Blanche		
Blanche Nursery Co., Byers, Flanagan & Son, 3	Medium	Fruit
Fayetteville		
Webb & McCalla	Small	Greenhouse
Flintville		
Lincoln County Nursery Co	Small	Fruit
Taft		
Coldwater Nursery Co., W. W. Twitty & Sons, 3	Medium	Fruit
LOUDON COUNTY		
Loudon		
Tennessee Nurseries, A. W. Ward	Small	Fruit

Name and Address.	*Size.*	*Stock Grown.*
McMINN COUNTY		
ATHENS		
J. P. Minge	Small	Strawberry Plants
MACON COUNTY		
REDBOILING SPRINGS		
T. J. Wooten	Small	Fruit
MADISON COUNTY		
JACKSON		
T. J. Frye	Small	Greenhouse
Miss M. E. McCowat	Small	Greenhouse
Mrs. G. H. McNeil	Small	Greenhouse
Miss Lora Spah	Small	Greenhouse
Mrs. J. A. Cunningham	Small	Greenhouse
T. L. Metcalfe	Small	Greenhouse
MEDON		
Madison County Nursery Co., Smith Bros	Small	Fruit
MARSHALL COUNTY		
CORNERSVILLE		
Richland Nursery, A. N. Bligh	Small	Grapes and Berries
LEWISBURG		
Mrs. Alice Tillman	Small	Strawberry Plants
MAURY COUNTY		
COLUMBIA		
W. T. Erwin	Small	Grapes and Berries
Oakland Nurseries, W. Y. C. Grant	Medium	Fruit and Ornamentals
T. W. Sowell	Medium	Grapes
John W. Thompson	Small	Greenhouse
CULLEOKA		
Maple Nurseries, Calvert Bros	Small	Ornamentals

Name and Address.	*Size.*	*Stock Grown.*
MONROE COUNTY		
Sweetwater		
James P. Richardson, 3	Small	Strawberry Plants
MONTGOMERY COUNTY		
Clarksville		
Evergreen Lodge, James Morton	Medium	Greenhouse
Central Greenhouse, T. L. Metcalfe	Small	Greenhouse
M. E. Heitt	Small	Greenhouse
OBION COUNTY		
Union City		
J. C. Johnson	Small	Catalpa and Black Locust
J. K. Postma	Small	Greenhouse
RHEA COUNTY		
Dayton		
John R. Abel	Small	Strawberry Plants
J. D. & S. L. Ellis	Small	Strawberry Plants
Mrs. S. F. Reeder, 5	Small	Strawberry Plants
Mrs. Lillie Sinclair, 5	Small	Strawberry Plants
S. W. Gill	Small	Strawberry Plants
Gilbreath Fruit Co	Small	Strawberry Plants
ROANE COUNTY		
Harriman		
W. W. Wallace	Small	Strawberry Plants
ROBERTSON COUNTY		
Greenbrier		
The Greenbrier Nursery Co., Inc., R. R. Harris	Medium	Fruit and Ornamentals

Name and Address.	*Size.*	*Stock Grown.*
RUTHERFORD COUNTY		
Murfreesboro		
Stone's River Nurseries, Dr. W. C. Bilbro	Medium	Fruit
Mrs. S. J. Hunt	Small	Ornamentals
Rutherford Fruit & Nursery Co., Chas. R. Givans	Small	Fruit
J. G. McGowan	Small	Ornamentals
SEVIER COUNTY		
Gatlinburg		
H. B. Kear	Small	Fruit
SHELBY COUNTY		
Memphis		
Johnson's Greenhouses	Medium	Greenhouse
Memphis Floral Co	Large	Greenhouse
Memphis Nursery, J. H. Boyd	Medium	Fruit
Koen & Smith, 4	Small	Fruit and Ornamentals
Otto Schwill & Co., Schwill & Heckle	Small	Fruit and Ornamentals
Granahan Greenhouses	Small	Greenhouse
Pearson & McCarthy	Medium	Greenhouse
Max Raupp	Small	Ornamentals
Idlewild Greenhouses, Otto Schwill	Medium	Greenhouse and Ornamentals
Evan McKenzie	Small	Greenhouse
SMITH COUNTY		
Gordonsville		
R. D. Coffee	Small	Fruit
SULLIVAN COUNTY		
Bristol		
The Globe Nurseries, Wood Bros. & Nickels	Large	Fruit and Ornamentals

Name and Address.	*Size.*	*Stock Grown.*
Bristol Floral Co	Small	Greenhouse
J. R. Richardson	Small	Greenhouse
SUMNER COUNTY		
GALLATIN		
W. H. Brizendine, 4	Medium	Strawberry Plants
R. G. Hill	Small	Strawberry Plants
J. W. Hill	Medium	Strawberry Plants
R. D. McClain, 3	Medium	Strawberry Plants
Perce & Shamberger	Medium	Strawberry Plants
Mrs. F. C. Stewart	Small	Strawberry Plants
PORTLAND		
Donoho Bros	Medium	Fruit
WARREN COUNTY		
DAYLIGHT		
New Home Nursery, J. H. Wright	Small	Fruit
Short Mountain Nursery, Davis & Perser, 2	Small	Fruit
DIBRELL		
Dibrell Nursery, I. H. Griffith	Small	Fruit
S. D. Ellrod & Son	Small	Fruit
IRVING COLLEGE		
Taylor Perry	Small	Ornamentals
MCMINNVILLE		
Forest Nursery & Seed Co., J. H. H. Boyd, 2	Medium	Shade and Ornamentals
Highland Nursery, J. B. Loring & Son, 4	Small	Fruit
SMARTT		
Craven & Son	Small	Fruit
Solomon Craven	Small	Strawberry Plants

Name and Address.	*Size.*	*Stock Grown.*
WILLIAMSON COUNTY		
FRANKLIN		
Truett Bros	Small	Greenhouse and Ornamentals
James E. Scobey	Small	Strawberry Plants
WILSON COUNTY		
LEBANON		
Green Bros., 2	Small	Fruit
Scott Nursery, A. C. Scott, 5	Small	Fruit
Lebanon Floral Co	Small	Greenhouse
MARTHA		
Wilson County Nursery Co., Green Bros., 2	Small	Fruit

NURSERIES IN THE THREE DIVISIONS OF THE STATE.

YEAR	EAST	MIDDLE	WEST	TOTAL
1905	61	106	27	194
1906	54	115	40	209
1907	62	118	49	229
1908	62	114	71	247
1909	69	115	67	251
1910	62	111	69	242

RESTRICTIONS ON OUTSIDE NURSERYMEN.

Nurserymen outside the State desiring to do business in Tennessee must annually file in the office of the State Entomologist prior to shipping, a duplicate copy of the season's inspection certificate, signed in person by an authorized official. Each individual shipment (order) must be accompanied by valid copies of inspection and fumigation certificates; otherwise consignments will be confiscated. All shipments must be plainly labeled with names of consignor and consignee.

All nursery stock sold or shipped into the State must be fumigated with hydrocyanic acid gas and a *Fumigation Tag* attached to each and every shipment.

At present 101 nurseries have filed certificates in this office and are entitled to ship into Tennessee.

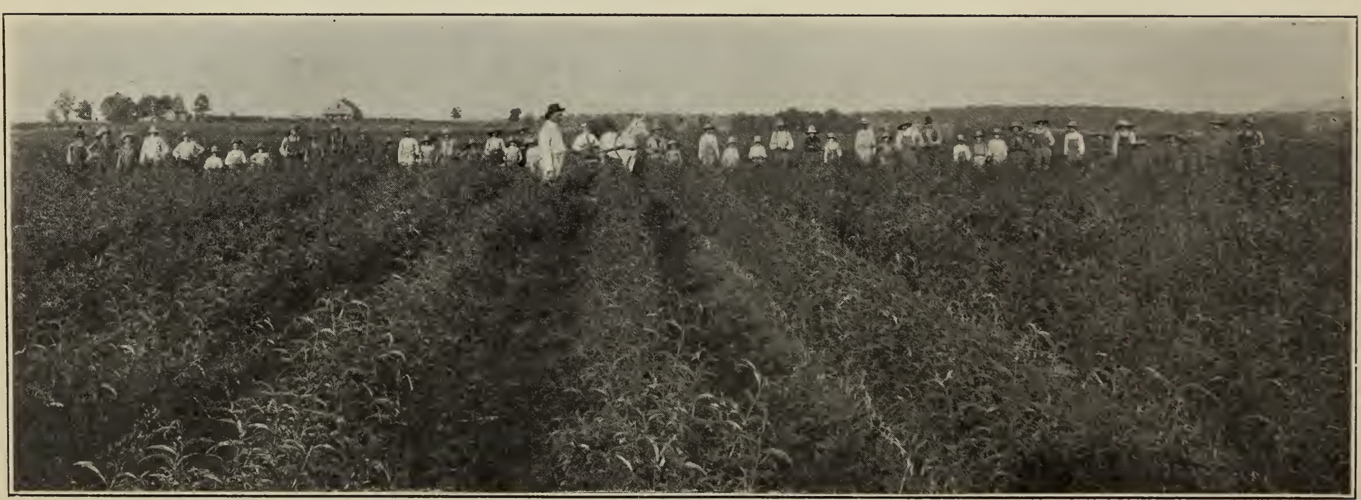


Fig. 1. Budding Peaches in a Tennessee Nursery.

Placards containing the following directions are tacked in all the fumigators:

TENNESSEE STATE BOARD OF ENTOMOLOGY

KNOXVILLE

FUMIGATION

PREPARED BY

G. M. Bentley, State Entomologist and Plant Pathologist
Knoxville, Tennessee

Directions for ....
(Name of Nursery)

....
(Address)

Note.—Fumigation is only required on stock of the following kinds: Apple, Cherry, Peach, Pear, Plum and Quince. All stock of these kinds, whether buds, grafts, scions, or trees, is required to be fumigated before it is shipped from any Nursery in Tennessee.

Size of Box or Room..Cubic feet.

MATERIALS REQUIRED FOR FUMIGATING NURSERY TREES

Regular Dose for Trees	......oz. Cyanide of Potassium ......oz. Sulphuric Acid (liquid measure) ......oz. Water (liquid measure)
Special Dose for June Buds and very tender Peach Stock	......oz. Cyanide of Potassium ......oz. SulphuricAcid(liquid meas.) ......oz. Water (liquid measure)

The Cyanide may be weighed into doses several days in advance of the fumigation, each dose being wrapped in paper in a package by itself. These doses are kept in a tight tin can, fruit jar or other receptacle in a dry place indoors. The acid and water are measured as needed at the time of fumigating.

Trees may be fumigated a day or two before shipment and heeled in on the packing grounds, but in any case *never fumigate stock more than a week before it is to be shipped.* If the San Jose Scale is known to be present in the vicinity, do not fumigate stock until as late as possible before it is to be shipped. It is best to fumigate it the very day of shipment and pack it immediately after the operation.

DIRECTIONS FOR FUMIGATING.

1. The stock to be fumigated should be stripped and dry, then placed in the box or room.
2. Do not bundle trees tightly or fill room too full.
3. Measure water and pour into porcelain vessel.
4. Measure acid and pour into vessel with water.
5. Place vessel in position in box or room.
6. Unwrap dose of Cyanide and drop gently into vessel.
7. Close door quickly and tightly and do not open for thirty minutes.
8. Within forty minutes open fumigator.

THE STATE HORTICULTURAL SOCIETY

PROGRAM

NASHVILLE, January 26, 1911

MORNING SESSION, 10:00 O'CLOCK

Call to Order

Appointment of Committees	Nominations Auditing Resolutions

Report of Secretary and Treasurer

Symposium upon Apple Growing

The Tree and Its Soil	L. R. Neel, Columbia
Care and Culture the First Years	J. D. Ellis, Dayton R. A. Wilkes, Culleoka
Treatment of the Bearing Orchard	H. C. Scruggs, Nashville G. W. Swink, Medon Chas.Deitson,Spring City
Varieties of Apples for the Commercial Orchard	Prof. C. A. Keffer Thos. D. Reed, Nashville
How I Raised the Apples that took Eight Premiums at the State Fair	J. H. Blackburn, Santa Fe

AFTERNOON SESSION, 1:30 O'CLOCK

Reports of Committees

Election of Officers

Peach Growing in Tennessee	W. A. Easterly, Cleveland A. S. Woolen, Tazewell
Picking and Packing Fruit	A. J. Fletcher, Cleveland
Size and Color of Fruit	L. P. Potter, Smithville
Preserving Fruit for Demonstration Purposes,	G. F. Green, Washington, D. C.
Desirable New Fruits	John A. Young, Greensboro, N. C.
Ornamental Trees and Shrubs	Tom Joy, Nashville A. J. Byrns, Sylvia
Fruits Best Adapted to Tennessee and Their Orchard Treatment	Prof. John Daniels, Nashville R. A. Wilkes, Culleoka
Cultivation of the Strawberry	Will List, Sale Creek J. H. Gregory, Grand Junct. A. Horn, Soddy W. P. Wade, Kenton
Raspberry Growing	W. H. Montgomery, Chattanooga L. B. Searle, East Chattanooga
The Amateur's Fruit	Robert Morris, Ridge Top

NIGHT SESSION, 7:30 O'CLOCK

President's Annual Address	J. D. Ellis, Dayton
The Value of Displaying Fruits at the County, State and Tri-State Fairs	Frank D. Fuller, Hermitage

---

TENNESSEE STATE NURSERYMEN'S ASSOCIATION PROGRAM

NASHVILLE, January 27, 1911

MORNING SESSION, 9:30 O'CLOCK

Call to Order

Reading of the Minutes of the Last Meeting

Report of the Treasurer

Appointment of Committees	Nominations Auditing Resolutions

Address of Welcome...... Hilary Howse, Mayor of Nashville
Response ....J. E. Scobey, Franklin
Cold Storage of Nursery Stock ..... Henry Chase, Huntsville, Ala.
The Importance of Properly Grading and Packing Nursery Stock .... J. Van Lindley, Pomona, N. C.
Co-operation and Organization .... Percy Brown, Spring Hill
Science in Agriculture and Horticulture, Prof. H. A. Morgan, Knoxville
The Problem of Unskilled Labor in Nursery Business, R. Twitty, Taft
Field Notes on Budding........................C. C. Byers, Blanche
Nursery Management........................Harry Nicholson, Winchester
Knowing and Doing ....Sam. P. Fowler, Clinton

AFTERNOON SESSION, 2:00 O'CLOCK

Executive Meeting: Reports of Committees, Election of Officers
New Roses Worth Growing............S. W. Crowell, Roseacres, Miss.
Tennessee as a Nursery State...... J. Marvin Miller, Winchester; G. E. Nickels, Bristol; W. H. Davis, Smithville
How Foreign Nursery Stock is Grown .... R. C. Berkmans, Augusta, Ga.; A. A. Newson, Knoxville
Commercial Apple Growing from a Nurseryman's Standpoint, W. H. Stark, Louisiana, Mo.
The Nurseryman's Responsibility........Gilbert Marshall, Nashville
Shall We Profit by Our Mistakes?..................J. H. Austin, Antioch
The Nurseryman and the Landscape Gardener, Otto Schwill, Memphis
The Need of Better Care of the Nursery, C. Pennington, Rutherford

EVENING SESSION, 7:30 O'CLOCK

President's Annual Address........................A. I. Smith, Knoxville
The Pen and Press in the Work, R. S. Walker, Chattanooga, Editor of the *Southern Fruit Grower*
Ornamental Nursery Stock............... James Morton, Clarksville; Peter Gettys, Knoxville
Home Lawns—How to Plant and Care for Them, H. A. Clark, Wartrace

Adjournment

After adjournment there will be an Informal Reception and Smoker to which all are cordially invited.

INSPECTION FOR THE BROWN-TAIL AND GYPSY MOTHS.

In January and February considerable time was devoted to the inspection of all imported nursery stock coming to the State from foreign countries, for the purpose of detecting the winter nests of the brown-tail moth (*Euproctis chrysorrhœa* Linn., Fig. No. 3) and the egg masses of the gypsy moth (*Porthetria dispar* Linn.). Notices were sent by us to the nurserymen early to inform the office at once upon arrival of these foreign shipments and not to open a case until an inspector was on the grounds to oversee the inspection. In this matter we had the full co-operation of the nurserymen and every foreign shipment was thoroughly inspected. Out of the several hundred cases inspected, there were from five to twenty nests of the brown-tail moth taken from each (Figure No. 4). When we consider that in each nest there were from 50 to 150 living caterpillars and that their escape might have established this destructive pest in the State, the importance of this inspection is evident (Figure No. 2). The introduction of this pest into Tennessee would mean nothing short of a calamity to the agricultural, horticultural and forest interests of the State. During the regular nursery inspection the past summer a second inspection was made on the premises where the foreign shipments were examined to determine if any of the caterpillars had escaped. In no case were indications of their presence found.

The brown-tail moth inspections were made at the following places: Marble City Nursery Co., Knoxville; Knoxville Nursery Co., Knoxville; Easterly Nursery Co., Cleveland; Chattanooga Nurseries, Chattanooga; Southern Nursery Co., Winchester; Commercial Nursery Co., Winchester; Tennessee Wholesale Nurseries, Winchester; Cedar Hill Nursery Co., Winchester; Globe Nurseries, Bristol. Many of the smaller nurseries purchased their foreign stock from some of the above named nurseries and had the inspections made before shipment.

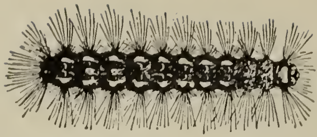


Fig. 2. Caterpillar of Brown-tail Moth, Full Grown (after Fernald).

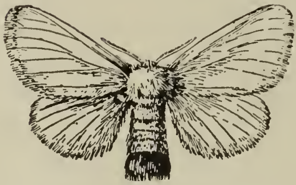


Fig. 3. Adult Brown-tail Moth, Natural Size (after Fernald).

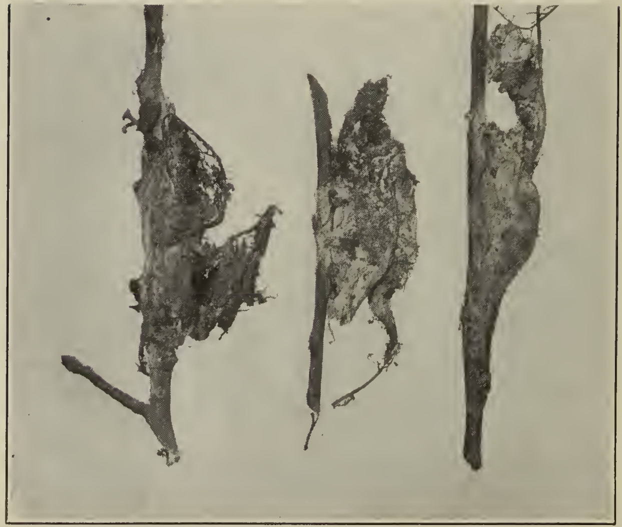


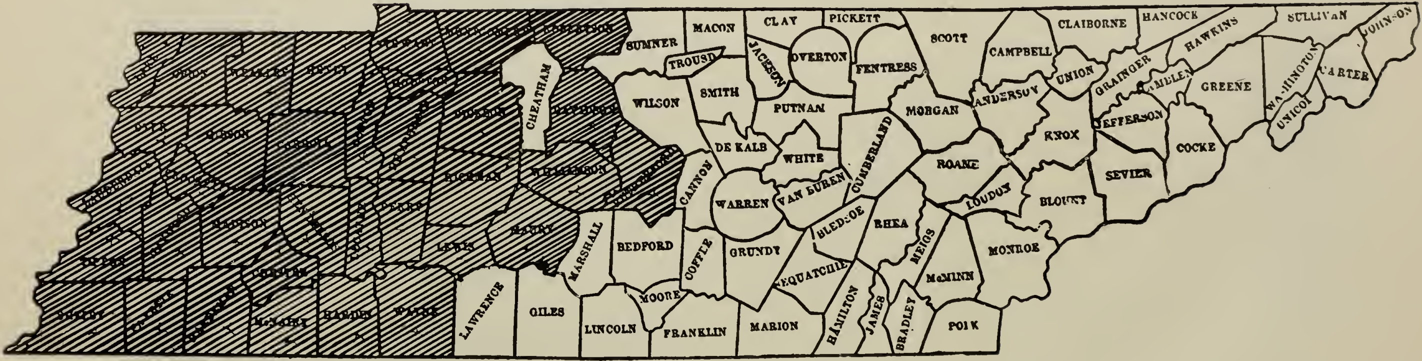
Fig. 4. Winter Nests of the Brown-tail Moth (original).

THE SEVENTEEN-YEAR "LOCUST" (*CICADA TREDECIM* LINN.) IN TENNESSEE IN 1911.

Because all of West and a large part of Middle Tennessee are to be infested with the "locust," or periodical cicada, in the spring of 1911, timely warning is hereby given to the orchardists in order that they may delay the pruning of their trees until after the injury has been done by this insect. After the visitation of the "locust" the injured twigs and branches may be cut off and burned. It is further recommended that orchard plantings be delayed until after the "locust" has appeared. The trees may be planted in the fall of 1911 and the serious setback of the cicada injury thus be evaded. In Tennessee there occur two races of the periodical cicada, those that require seventeen and those that require thirteen years for their development (FIGURES Nos. 5 and 6). The 1911 brood is known as the XXIII, representatives of which are of the thirteen-year race. The Fourth Annual Report of this Board gives more complete information regarding the life-histories of both of these forms of the periodical cicada. The following Map, No. 1, shows the occurrence of brood XXIII as it is due to appear this coming spring. It will be noticed that Cheatham County is exempt from the invasion, but this is doubtless due to missing records and the form may be expected to occur in this as well as in adjoining counties.

The counties to be highly infested with the "locust" in the spring of 1911 are: Lake, Obion, Dyer, Lauderdale, Tipton, Shelby, Fayette, Haywood, Crockett, Gibson, Weakley, Henry, Carroll, Madison, Henderson, Chester, Hardeman, McNairy, Hardin, Decatur, Benton, Stewart, Houston, Humphreys, Perry, Wayne, Lewis, Hickman, Dickson, Montgomery, Robertson, Davidson, Williamson, Rutherford, and Maury.

The "locust" will appear in May of 1911 and be present throughout the month of June. The chief injury is done by the sawing into the twigs and branches by the females (FIGURE No. 7). In these punctured and sawed slits the eggs are deposited.



'Map No. 1. Brood XXIII. Due to Appear in Shaded Counties in 1911 (original).

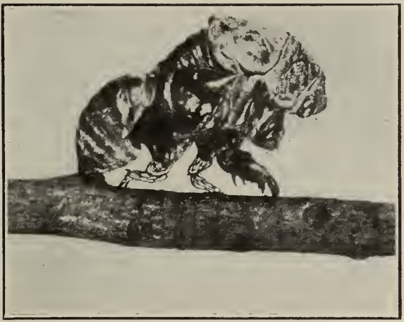


FIG. 5. Emergence of Adult Cicada from Nymphal Case (original).

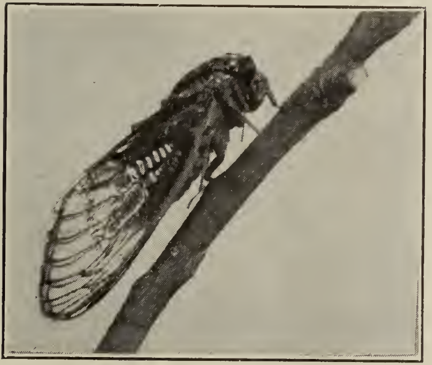


FIG. 6. Adult Cicada (original).

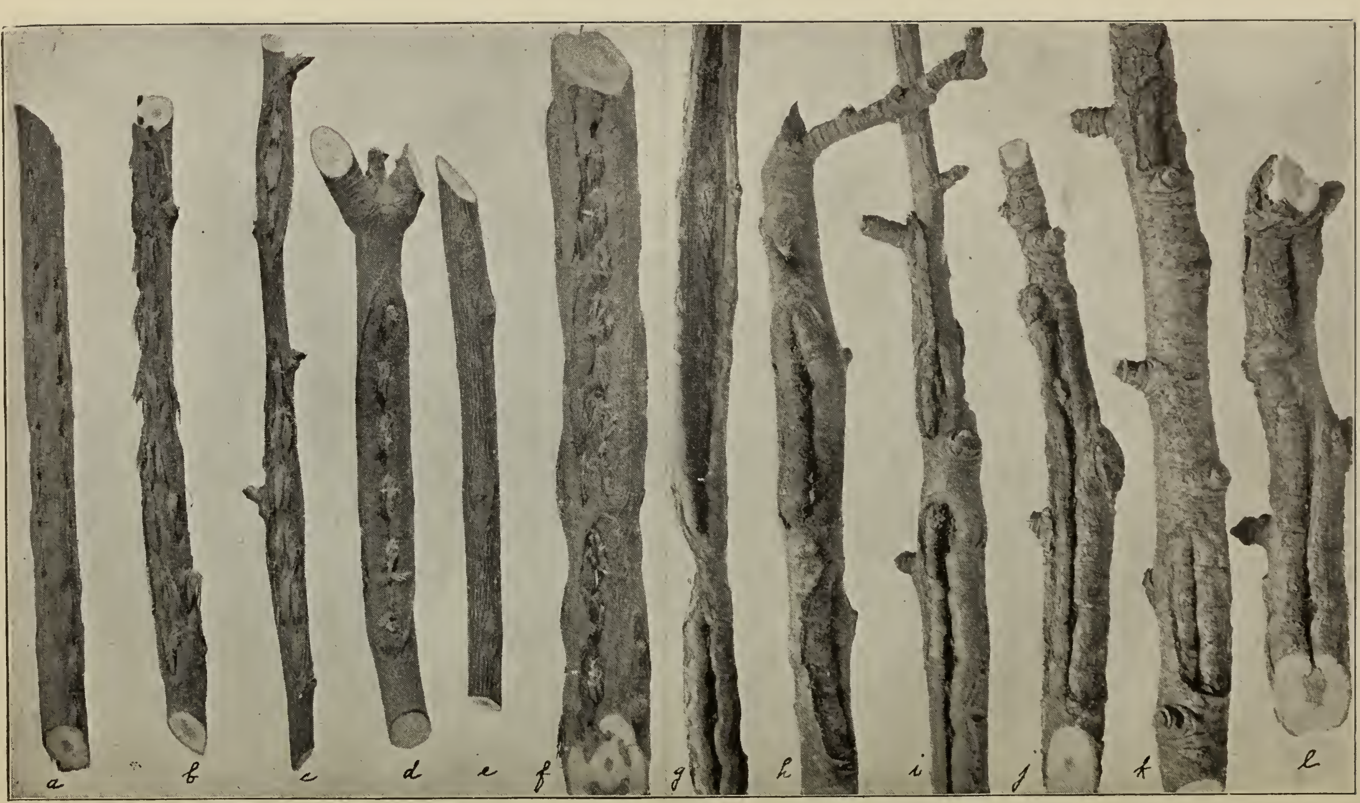


FIG. 7. WORK OF THE PERIODICAL CICADA.

(*a*) Fresh wounds in maple; (*b*, *d*, *e* and *f*) Condition four months later in maple; (*e*) Wounds healed in one season; (*b*) Three-months-old scars in wild cherry, showing that the punctures may extend both toward the top and base of the twig; (*g*-*l*) Cicada scars 17 years old on terminal branches from old trees; (*g*, *h*, *i*) Apple; (*j*, *k*, *l*) Pear. (After Marlatt, Bulletin 71, Bureau of Entomology, U. S. Dept. of Agr.)

THE NEW NATIONAL INSECTICIDE LAW.

Attention is hereby called to the requirement made by Congress, to go into effect January 1, 1911. It is known as the Insecticide Law of 1910. Of great importance is this law to all users of insecticides and fungicides in view of the fact that all goods of this nature must be properly labeled and a guarantee of their contents placed upon each and every package or container. In the past much trouble has resulted from the use of inferior poisons, and many times heavy losses have befallen users endeavoring to follow directions given in bulletins or by persons informed, the directions being correct but intended for chemicals of known strength. Under the new requirement all preparations for combating insects and fungous diseases will be properly labeled and the user will be, in a measure, able to apply them judiciously.

This Board ever stands ready to assist the people of Tennessee in the selection and use of insecticides, fungicides and fumigants. Most of the proprietary remedies in these lines are experimented with by us and their true worth will be freely given or the false claims made for them exposed. We frequently hear of farmers, fruit-growers and florists buying preparations of this kind under a guarantee that their money will be refunded if the goods fail to give the results promised. In the majority of these cases not only are the results of no value, but injuries are evidenced, time is lost, faith in all treatments weakened and no rebate obtained on purchases. Far better is it to consult your State Board of Entomology previous to purchasing and know exactly what you are buying, what price you should pay, and what results you may expect. Some of the patent insecticides and fungicides have real worth and in many cases we strongly recommend their use over preparations made at home. The Insecticide Law of 1910 will raise the standard of all this line of goods and thus simplify and advance their use among horticulturists and agriculturists.

ORCHARD SURVEY.

Commercial orcharding in Tennessee is in its infancy at present, notwithstanding the fact that there are many yielding orchards in the State and annually new plantings are made. The fruit-growing industry in Tennessee bids fair to become one of the leading pursuits, having as it does suitable soil and most favorable climatic conditions, together with vast elevated areas and mountainous regions which can be purchased reasonably and at the same time afford ideal sites for orchards, vineyards and small fruits. In Haywood, Maury, Madison, Montgomery, Morgan, Rhea, Bradley, and Sullivan Counties large orchards are found, all of which are in most prosperous condition, attention having been given to cultivation, pruning and spraying. Paying harvests have been gathered and more attention is now being directed to fruit-growing in Tennessee than ever before. It will only be a short time before this industry will become one of the money crops of the State. It needs encouragement, however, and especially should this Board be in position to render more direct help and co-operate more effectively with the orchardists. At the present time, when there are numerous insect pests and fungous diseases ever ready to attack the trees and vines, and in fact destroy them unless timely remedial steps are taken, it is the more necessary that the growers shall know the best spray materials and how to use them; the most efficient spray machinery and how to use and care for it; the most approved methods of cultivation and pruning, when to perform and how long to continue the operations.

In all of these and many other ways the State Board of Entomology can render most efficient assistance, which will mean the success of the present plantings and more and larger orchards in the near future. This work of the orchard survey of the State may be conducted under the following heads:

I. The listing of all the orchards of the State.

II. Inspections for the purpose of gaining information as to the varieties of the fruits grown, soil, sites, drainage, cultivation, methods of pruning, marketing, etc.

III. Public demonstrations giving all the best practices in spraying, pruning and the general care of the orchard.

IV. Co-operative experiments in the use of insecticides and fungicides.

The information gathered from this careful orchard investigation would be of inestimable value to this Board in showing the existing conditions in the orchards of the State and in furnishing

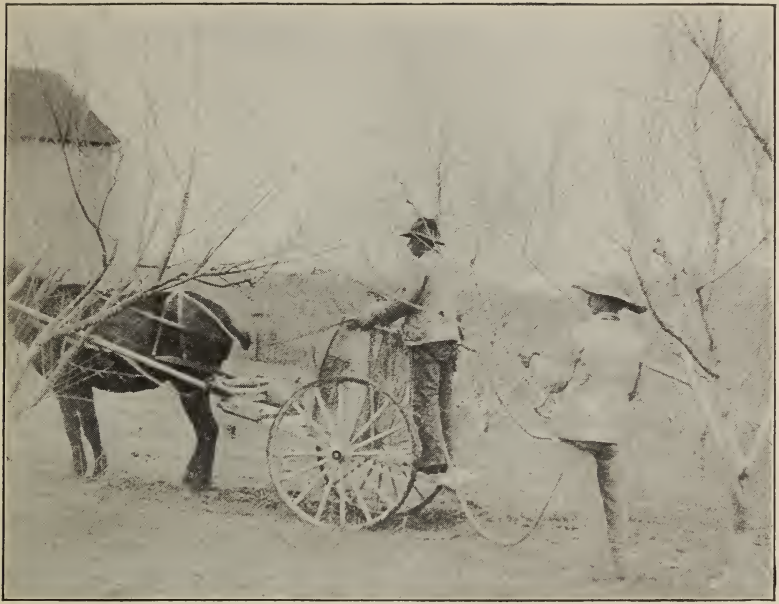


FIG. 10. An Inexpensive yet Efficient Spraying Equipment (original).

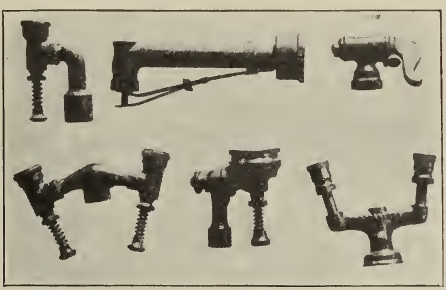


FIG. 11. Desirable Spray Nozzles.

UPPER ROW LEFT TO RIGHT—Single Vermorel, McGowen, Bordeaux.

LOWER ROW LEFT TO RIGHT—Double Vermorel, Mistry, Double Spramotor.

(After Britton.)

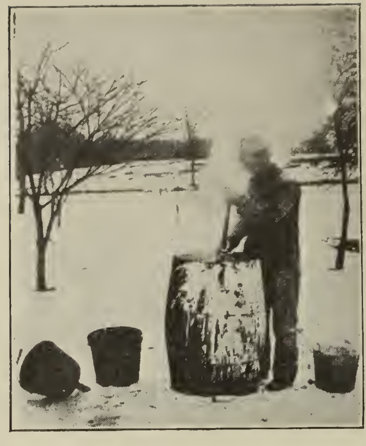


FIG. 8. Making Self-boiled Lime-sulphur Solution (after Britton).

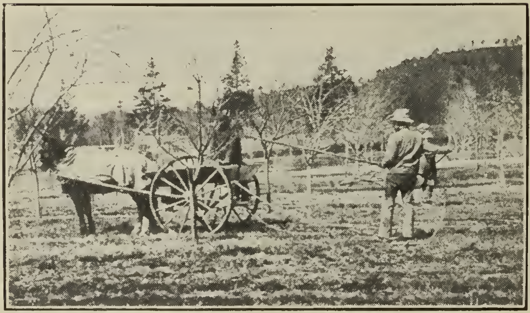


FIG. 9. Applying the Mixture—Mounted Barrel Sprayer—Two Leads of Hose (after Britton).

data for publication that would be of much practical value. For properly carrying out this survey the services of three practical orchardists would be necessary, one being stationed in each of the divisions of the State, East, Middle and West Tennessee. Spraying and pruning equipment would also be needed, as well as supplies of insecticides and fungicides for making the demonstrations. The real good that would result to the fruit-growing interests and the income that this industry would bring to Tennessee are sufficient reasons why an orchard survey is worthy of careful consideration and a liberal appropriation for this investigation should be earnestly solicited from the Legislature of 1911.

DEMONSTRATIONS IN MAKING AND APPLYING SPRAY MIXTURES.

There have been many calls for orchard and nursery demonstrations in making and applying the spray solutions for combating the different forms of injurious insects. Due to lack of funds for this work, the greater number of these requests were not granted. At the places named below, however, demonstrations were given, and the greatest of interest was shown in this work. It has been a means of forwarding the proper care of the orchards in localities where the instructions were given. The attendance at these meetings was as follows: Santa Fe, Maury County, 15; Columbia, Maury County, 25; Franklin, Williamson County, 6; Clarksville, Montgomery County, 50; Crossville, Cumberland County, 58; Pleasant Hill, Cumberland County, 36; Tazewell, Claiborne County, 10; Dayton, Rhea County, 150; The average attendance was 44, a very good number considering that this work was conducted during the winter.

At these meetings emphasis was laid upon the recognized sprays for winter and summer spraying; the boiled and self-boiled lime-sulphur solutions were made and their use was fully explained (Figure No. 8). The matter of sprayers, hose, nozzles, extension rods, etc., as well as the proper time for doing the work, was carefully explained (Figures Nos. 10 and 11). After these spray mixtures were made they were applied to the trees, which had first been properly pruned (Figure No. 9). The principal benefit derived from these orchard talks was that many fruit growers adopted the spraying of their orchards, from which practice most gratifying results were obtained. Similar demonstrations of orchard practices should be carried on in different parts of the State. There is no one method that would be of greater help to the fruit-growing interests and more certainly further the success of this industry, for which Tennessee is peculiarly adapted.

INSECT NOTES FOR THE YEAR.

The year just closed has not been characterized by any phenomenal insect or fungous outbreaks in Tennessee; yet there has been in sections of the State heavy loss resulting from pests that were more or less local in causing injury. In the following paragraphs several of the worst insect pests of the year are described and notes given on their life-histories with remedies for their control.

THE SAN JOSE SCALE.

The San Jose scale (*Aspidiotus perniciosus* Comst.) has been described at length in Bulletin No. 4 of the State Board of Entomology, and time will be taken here to give only a very brief life-history of this insect, with methods for combating it. There are at least five broods of the San Jose scale annually in Tennessee.

Young active scale have been found as early as March and as late as October. The adult female, if not too crowded, is nearly round, about 1-16 of an inch in diameter, with a characteristic elevated place in the center, known as the nipple, with concentric circles around it. The male is many times longer than it is wide, with the nipple at one end. The female, when from 35 to 40 days old, gives birth to living young, completing her life in about 2 weeks. The male scale becomes full-grown in about 25 days after birth; at this time it is a very small two-winged insect capable of flying about. As a young scale, however, it can not be distinguished from the female and not until after the second molt, which takes place in about 20 days, does the male scale begin to elongate and become recognizable from the female scale (Figure No. 12).

This insect is one of the worst orchard pests if left to run its own course; yet if known and combated at the proper time with the right material it is one of the easiest of all orchard pests to control. It is generally scattered in Eastern and Western Tennessee, but it has not been found in many portions of the Middle division of the State.

Remedies.—Of the many preparations advertised to kill this scale, the boiled lime-sulphur solution, if properly made, is the best. This may be purchased in concentrated form and then reduced at the rate of one of preparation to ten of water or it may be made at the orchard in the manner described below:

The time for applying the lime-sulphur wash is while the trees are dormant, as in the late fall, winter, or early spring. Prune the trees before spraying and do *thorough spraying*. If all parts of the trees can not be covered at the first spraying repeat the process soon.

Boiled Lime-Sulphur Wash.

Quicklime	21 pounds
Sulphur (flowers or flour)	18 pounds
Water	50 gallons

Slake lime in about 5 gallons of hot water; add the sulphur that has been made into a thick paste with water; boil, stirring frequently, for 40 minutes to 1 hour; dilute all to make 50 gallons. While boiling add water from time to time to keep the solution thin enough to boil readily. Apply this wash while it is hot. Stir frequently while wash is boiling.

The above wash may be boiled by fire or steam, according to the amount to be made. An average orchardist will find that very satisfactory boiling may be done by using iron kettles, holding from 25 to 50 gallons. There should be two of these, one for boiling the wash, the other for heating water. The kettles may be set in a brick or stone base, with space sufficient beneath for placing wood or coal.

The large orchardist will find it economical to practice the boiling of the wash on a larger scale, using steam and boiling from 2 to 6 barrels at a time.

The *Boiled Lime-Sulphur Wash* as yet *has no equal* for its cheapness and efficiency in killing the San Jose scale.

The salt which was formerly added to lime-sulphur washes has no appreciable useful effect—with it the spray adheres no

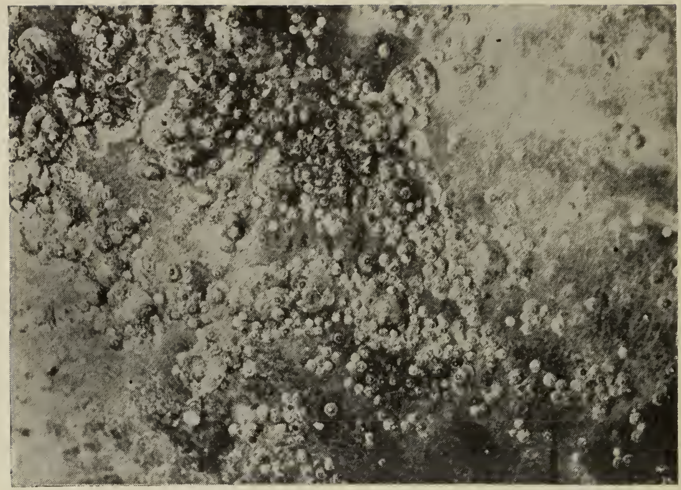


FIG. 12. A Group of San Jose Scale of Different Ages, slightly magnified (After Lowe and Parrott, N. Y. Agr. Exp. Sta., Bul. 193).

longer and kills scale no better. The addition of salt increases the cost of the wash and, furthermore, the cool wash does not pass through the nozzle so readily when salt is added.

Bluestone—copper sulphate—added to the lime-sulphur wash has no beneficial effect as an adherent.

To make the lime-sulphur wash one should have suitable equipment. It is best to be so located that plenty of water may be handy.

THE HESSIAN FLY.

During the present year the wheat crop in Tennessee has suffered heavy loss due to injury done by the Hessian fly (*Mayetiola destructor* Say.). Indications are that next year the loss will be even greater. It is therefore important and timely that information be given regarding this destructive pest to wheat, barley and rye.

On many of the farms in Knox County the fly completely ruined the wheat this year. The infestation was very great in many other sections. Single infested stalks of wheat contained as many as sixteen larvæ and pupæ. Attention this year was first called to the damage being done on the farm of Major D. A. Carpenter, eight miles west of Knoxville. In a 20-acre field of wheat on this farm fully ninety per cent of the wheat was ruined. The attention of Professor F. M. Webster, of the U. S. Department of Agriculture, Bureau of Entomology, was called to this case and he at once sent one of his assistants to make investigations and gather some of the infested wheat. It was suggested by Professor Webster that parasites be introduced into this field and a study made of their effect. To this end stubble supposed to be infested with flaxseed stage of the fly which were parasitized with *Polynotus* were sent from Tower City, N. D. Excepting a small portion retained for careful study in the laboratory this stubble was placed in different parts of the wheat field on the Carpenter farm. Both the inspection of this stubble in the laboratory and its effect in the field indicate that there were no parasites in the stubble.

The study of the fly in the field mentioned will be continued. In this connection plantings of wheat were made at different times this fall on plots 20 feet square. The first

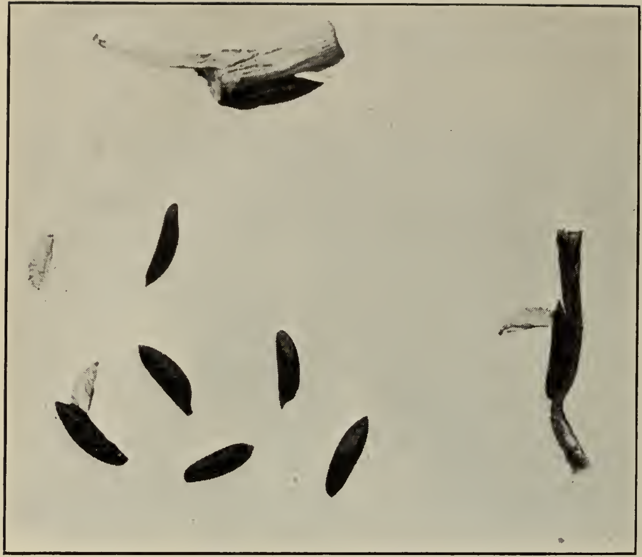


FIG. 14. Larva, Flaxseed, Pupa, and Empty Cases from Which the Hessian Fly has Emerged (original).

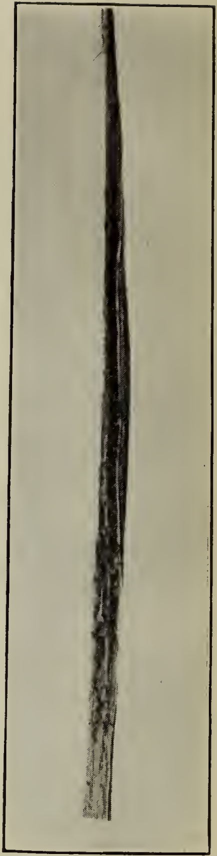


FIG. 13.
Eggs of Hessian Fly on Blade of Wheat (original).

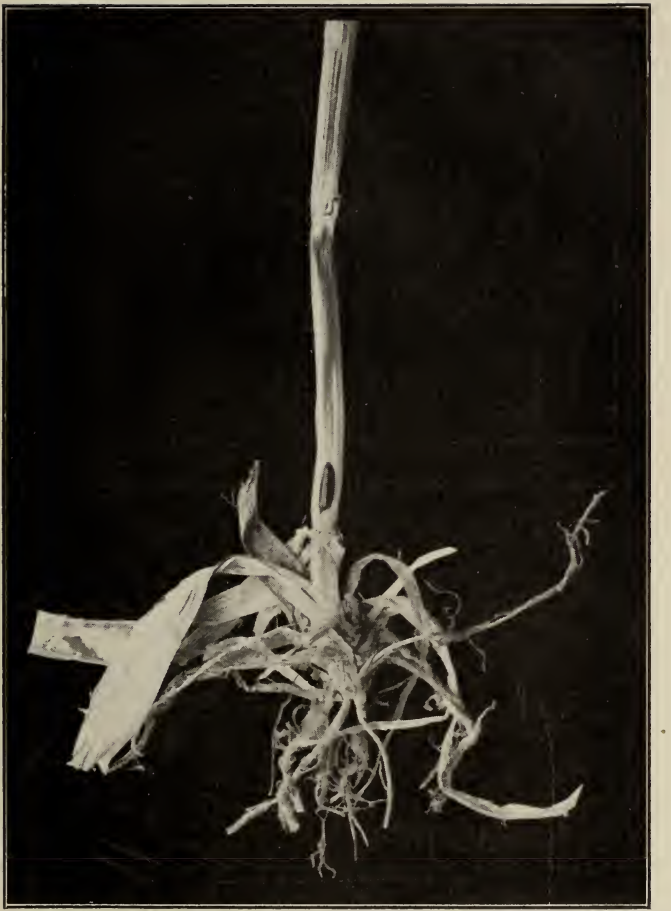


FIG. 15. Wheat Stem Showing Position of "Flaxseed" of Hessian Fly. (original).

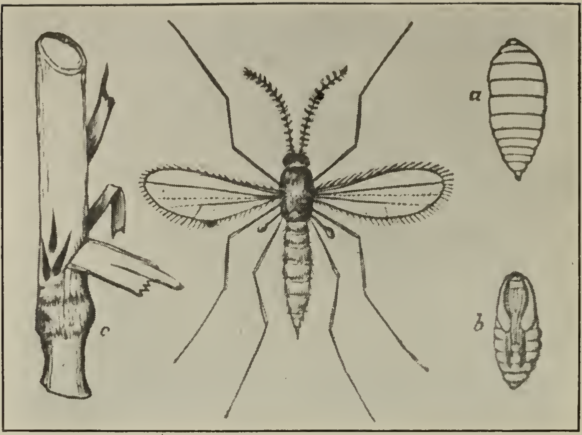


FIG. 16. (*a*) Larva; (*b*) Pupa; (*c*) Injured Wheat Stem; (*d*) Adult Fly.

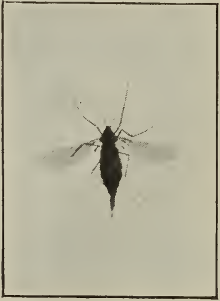


FIG. 17. Adult Female Hessian Fly (original).

planting was September 23rd, the last was on November 7th, each planting being 10 days apart.

In view of the likely appearance in destructive numbers of this wheat pest this next season a brief review of the life-history of the Hessian fly will be given here.

The eggs of this small mosquito-like insect are laid singly or in rows on the blades of the young wheat (FIGURE No. 13). In about 4 days small white maggot-like young hatches and at once begins to make its way down the leaf toward the sheath; here partly hid away it remains and sucks its food from the sap of the tender young wheat stem; after about four weeks this young form becomes brown and its outer covering hardens (FIGURE No. 15). This stage is known as the "flaxseed," from which develops the pupa (FIGURE No. 14). From this the fly of the fall brood emerges in April or May, while the fly of spring brood emerges in August or September (FIGURE No. 17). After mating the eggs are again deposited. As an adult the fly lives only a few days, the number of generations per year varying—there are at least two in this State. The winter and summer are passed in the "flaxseed" stage in young wheat, stubble or stacked straw (FIGURE No. 16). Those which pass the summer on stubble or in stacks emerge during the late summer or early fall and lay their eggs upon volunteer wheat or early plantings of the regular crop. The effect upon the stem is either to kill it in the fall or so injure it in the spring that it crinkles or tillers, often the plant is weakened beyond recovery.

Remedies.—The most effective remedies are in the form of preventives and may be mentioned as follows: Do not grow successive crops of wheat upon the same land. Select wheat that has a hard straw and one likely to stool and tiller freely. Give attention to getting a good seed bed, prepare the soil thoroughly. Burn or plow under all stubble on an infested field. Burn the leavings from threshing. Plow under volunteer wheat. Sow your wheat not earlier than October 10th to 20th.

Rotation.—Volunteer wheat is largely responsible for Hessian fly conditions throughout the State. This may be overcome either by a double-crop system, which would mean the planting of beans after wheat instead of seeding down the grass and clover in the wheat in the spring. A four-year rotation of rye and corn, followed by beans, followed by wheat, may also be recommended. Plow wheat stubble immediately after wheat harvest in order to destroy volunteer growth of wheat and fallow until August, then seed down to clover and grass.

THE WALNUT CATERPILLAR.

The walnut caterpillar (*Datana integerrima* Gr. & Rob.) occurs in all parts of the State and does much injury to the walnut, butternut, hickory and pecan trees by eating their leaves and in many cases completely defoliating the trees. When full-grown, the caterpillar is about 2½ inches long, dark, nearly black in color, and sparsely covered with long, silky, white hairs (FIGURE NO. 20). The eggs are of dull white color and are laid in masses of from 200 to 300 on the undersides of leaves. Figure No. 18 shows an egg cluster slightly reduced in size, while Figure No. 19 shows the same enlarged three times. The caterpillars feed in large numbers, clustered together. They first work on one leaf, then on a branch, completely cleaning them up as they go. When ready to molt they travel to some large limb or the trunk of the tree; gathered there in a wriggling mass they remain until their skins are cast, then return to the leaves and continue feeding (FIGURE NO. 21). After the caterpillars have attained their full growth they crawl down the tree and enter the ground. Here they become brown chrysalids and later emerge as moths (FIGURE NO. 22). The moth has a body measuring ¾ of an inch long and wings when spread measuring from 1⅝ of an inch in the male to 1⅞ of an inch in the female. The fore wings are of light brown color crossed by four darker brown lines; the hind wings are of pale yellowish color, unmarked. The winter is passed in the chrysalid stage in the ground. The life-history of this insect has not been worked out for Tennessee, but from notes obtained from the Tennessee Experiment Station we learn that feeding caterpillars have been found as early as June 24th and as late as October 17th. The records from another State show that the caterpillar required 25 days to become full-grown. The inference drawn from the last two statements is that there are about three generations of this walnut moth in Tennessee.

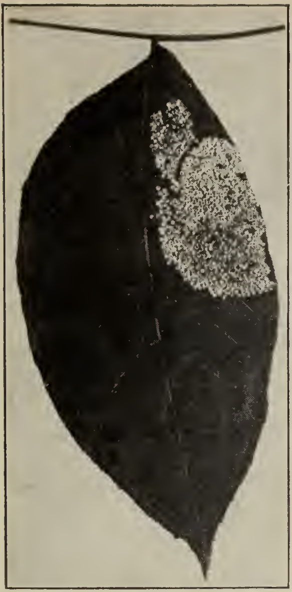


Fig. 18. Egg Mass of Walnut Moth, about one-half Natural Size (original).

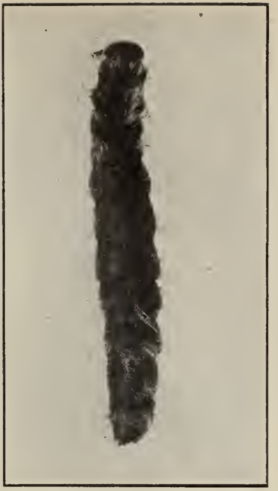


Fig. 20. Full-Grown Larva of Walnut Moth, Natural Size (original).

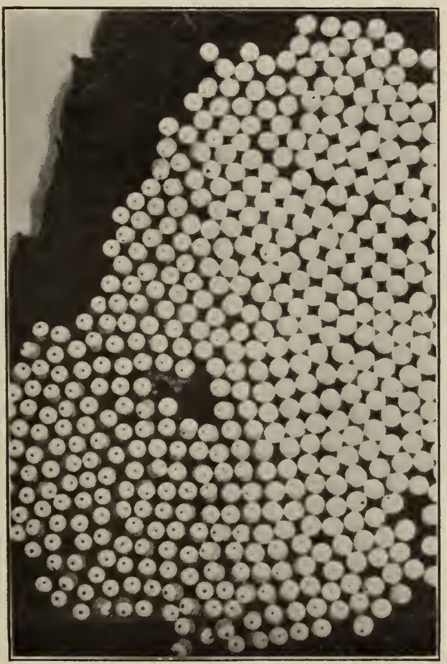


Fig. 19. Egg Mass of Walnut Moth Enlarged about twice (original).

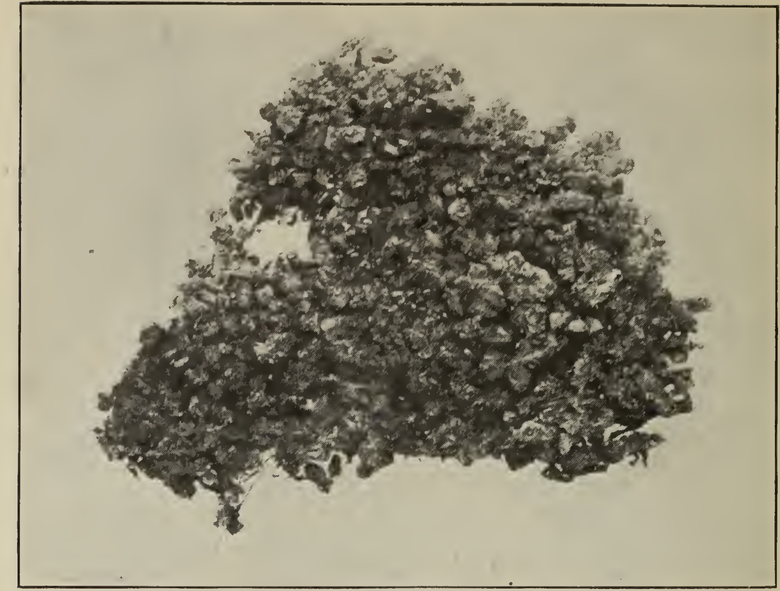


Fig. 21. Cast Molt Skins of Walnut Caterpillar (original).

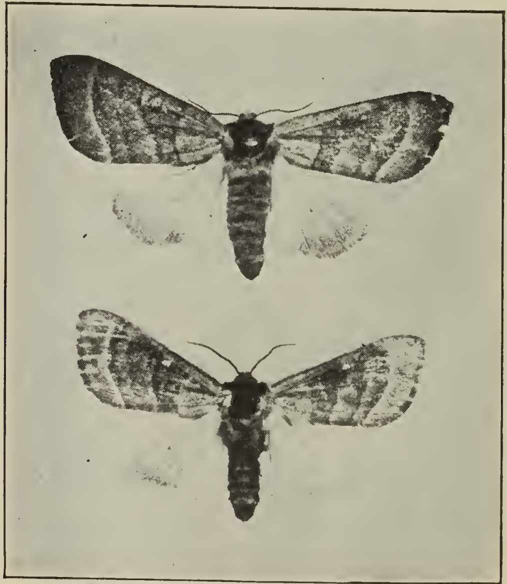


Fig. 22. Adults of the Walnut Caterpillar—Female above, Male below (original).

Remedies.—While the caterpillars are still young and feeding upon the leaves, they may be destroyed by spraying with arsenate of lead at the rate of from 2 to 3 pounds to 50 gallons of water. After the caterpillars have come down the tree and clustered there to molt, the mass may be burned or crushed. Parasites such as the Tachina flies are efficient in killing great numbers of this insect. The eggs of the fly are laid upon the caterpillar and later hatch into maggots, which feed upon their host, causing its death. So effective are these parasites that it is rare for the walnut caterpillar to do serious damage in the same place two successive years.

INSECTS IN STORED GRAINS AND SEEDS.

Many requests have come to this office asking for information regarding the insects infesting stored grains. In the following paragraphs are given the chief insects causing this trouble and effective methods for their control.

THE BEAN WEEVIL.

The eggs of the bean weevil (*Bruchus obtectus* Say) are laid upon the growing pod in the field. The young enter the growing bean, frequently several entering one bean. There they work after the crop is harvested, producing several generations, and often completely eat out the inside of the bean. Beans thus affected will produce weak plants, if they germinate at all; hence the weevil, if left to work upon the beans, will make them worthless as seed. The use of infested seed would encourage the continuance of the beetle (Figure No. 23).

Remedy.—The beans should be put into an air-tight enclosure and fumigated from 24 to 48 hours with carbon bisulphide used at the rate of 1 pound to every 100 bushels of beans, or 1 pound of bisulphide to every 100 cubic feet of space. Since carbon bisulphide is highly inflamable every precaution should be taken to keep it away from fire of any kind.

THE PEA WEEVIL.

The pea weevil (*Bruchus pisorium* Linn.) deposits its eggs on the young pods and its development is very similar to the bean weevil (Figure No. 24).

Remedy.—Same as above for the bean weevil.

THE ANGOUMOIS GRAIN MOTH.

The eggs of the Angoumois grain moth (*Sitotroga cerealella* Oliv.) are laid upon the young grain or upon the grain in the bin. In from 4 to 7 days these hatch; the young immediately bore into the kernels and in a few days transform into pupae, from which the moths emerge (FIGURE No. 25). The number of broods is governed by the season.

Remedy.—Same as above for the bean and pea weevils.

THE GRAIN WEEVIL.

The eggs of the grain weevil (*Calandra granaria* Linn.) are laid upon the grain, which may be any kind of stored grain, as corn, oats, wheat, barley, etc. The eggs hatch into small grub-like young, which burrow into the grain and eat out the kernels. In a few weeks they become full-grown, having passed through the pupa stage (FIGURE No. 26). This weevil has several broods a year.

Remedy.—Same as for the weevils above.

THE PICKLE WORM.

The cantaloupe growers of this State suffer more loss from the pickle worm (*Margaronia nitidalis* Cram.) than from any other insect. Its appearance in great numbers some years, followed by a season or two in which it will hardly be found, has caused many questions to be asked regarding its life-history. The eggs are laid by a moth about ¾ of an inch in length. They are usually placed upon the flowers, buds or tender portions of the vines of the cucumber and cantaloupe. The eggs hatch in from 4 to 6 days. The newly hatched forms feed upon the leaves and stems. They begin eating the melons after the first molt and continue until they pupate. A round hole is eaten to the center of the cantaloupe; some of the center is also eaten, and the whole melon is ruined for market. In a year in which these insects are plentiful they mean fully 75 per cent loss. The pupa is formed in debris or a folded leaf and from this the mature moth emerges. There are at least four broods of this insect in this State. They pass the winter in the pupa stage above ground, and emerge very late in the spring into a yellowish brown night-flying moth.

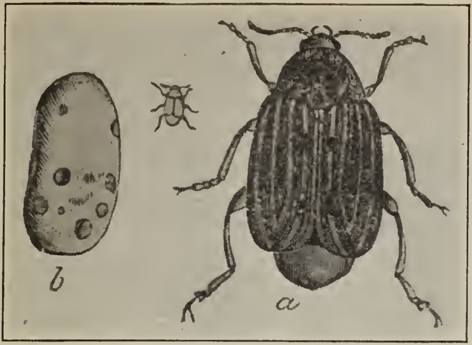


FIG. 23. (*a*) Bean Weevil, Many Times Enlarged; (*b*) An Infested Bean (after Riley).

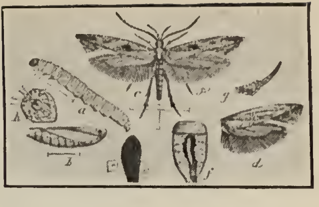


FIG. 25. The Angumois Grain Moth in its Different Stages (after Riley).

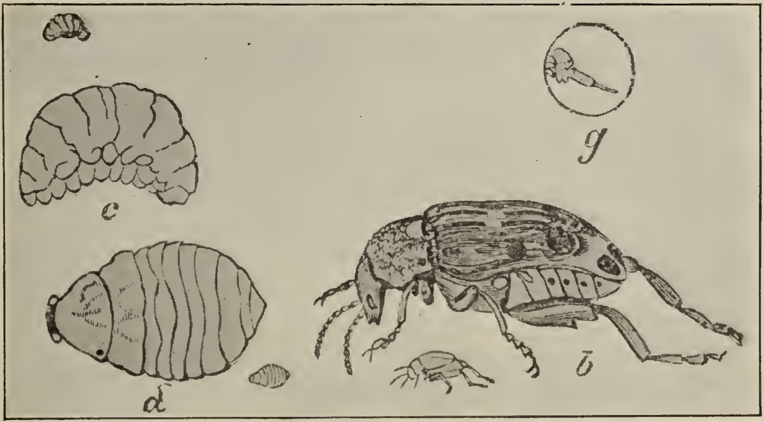


FIG. 24. Pea Weevil. (*b*) Adult; (*c*) Larva; (*d*) Pupa, All Enlarged (after Curtis).

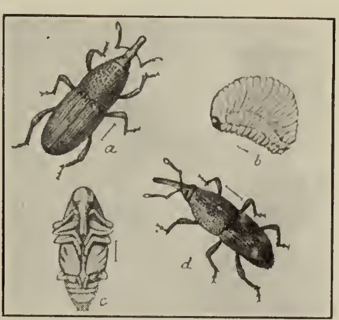


FIG. 26. Grain Weevils.
(*a*) Beetle; (*b*) Larva;
(*c*) Pupa; (*d*) Rice-weevil.
(After Chittenden.)

Remedies.—Since the pupa passes the winter above ground it follows that the destruction of all the vines, as soon as the crop is off, will prevent many moths from emerging. Deep plowing will also destroy many of the wintering forms. It is also advantageous to plant the cantaloupes early. Experiments by Quaintance and others prove that the squash planted as a catch crop works successfully. The squash is planted so the eggs of the pickle moth can be deposited in its bloom and vines and before the young become grown all the squash vines are destroyed.

THE APPLE APHIS.

Both nurserymen and orchardists suffer injuries to their young trees from the apple aphis (*Aphis pomi* DeGreer), a sucking insect. It is less than ½ inch in length, green in color, and frequents the underside of the leaves, especially those near the ends of the twigs. As a result of its attack the leaves curl and some blacken and die. This insect comes from the eggs which are laid in the fall on the twigs and branches and remain there all winter.

1st generation:—As the buds begin to open in the spring these eggs hatch into young lice-like insects, with long, slender, tube-like mouth parts, with which they begin at once to suck the juices from the twigs. They attain their growth in about 2 weeks, all being wingless and capable of producing some 50 living young without mating. These stem-mothers, as they are called, continue producing young for about 5 days.

2nd generation:—In from 8 to 9 days these young are fully grown, and some are winged, while others are wingless. The winged forms may fly away and establish new colonies, producing their young asexually, all of which are with wings, and in turn these produce forms which may or may not have wings.

The number of generations is governed by the duration of the warm weather. Upon the approach of cool weather the last generation occurs, in which true males and females are found. These mate and produce fertile eggs, which are placed upon the twigs and branches of the trees to remain all winter. In the spring their life-history is repeated, when non-sexual forms hatch from the over-wintering eggs (Figure No. 27).

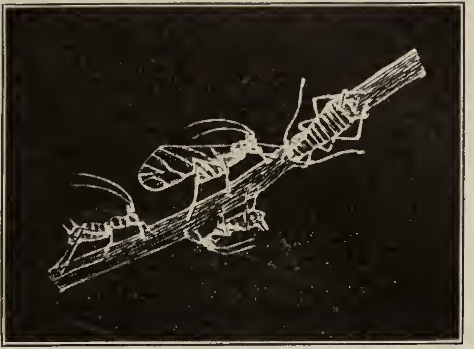


Fig. 27. Apple Aphis.

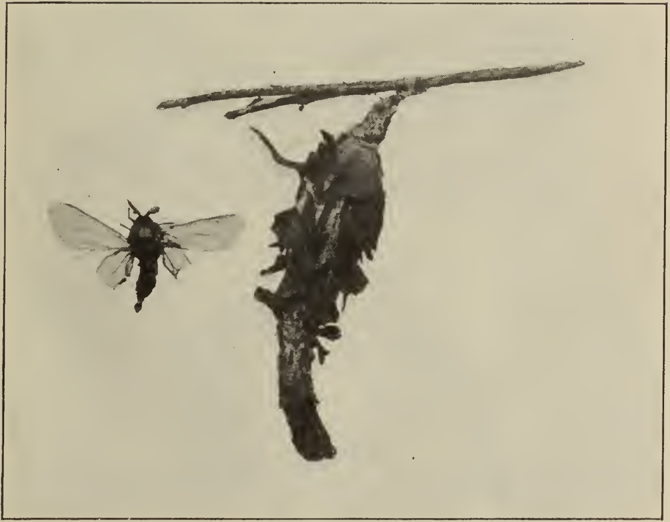


Fig. 28. Adult of Bag-worm, Male; Also its Case and Pupa Case (original).

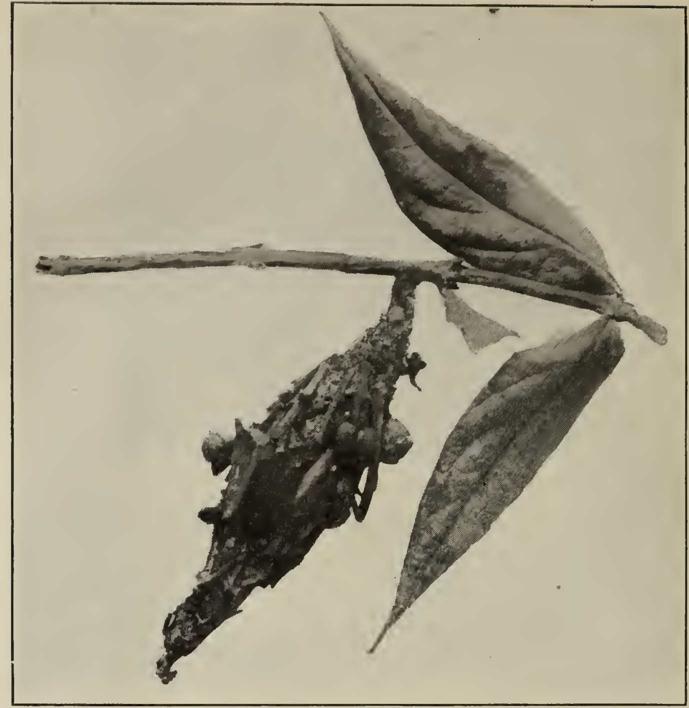


FIG. 29. Case of the Female Bag-worm (original).

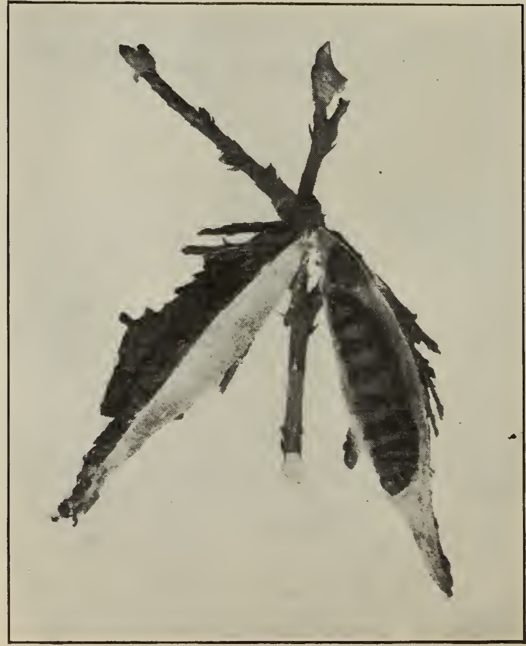


FIG. 30. Case of Female Bag-worm Cut Lengthwise, Showing Pupa Case (original).

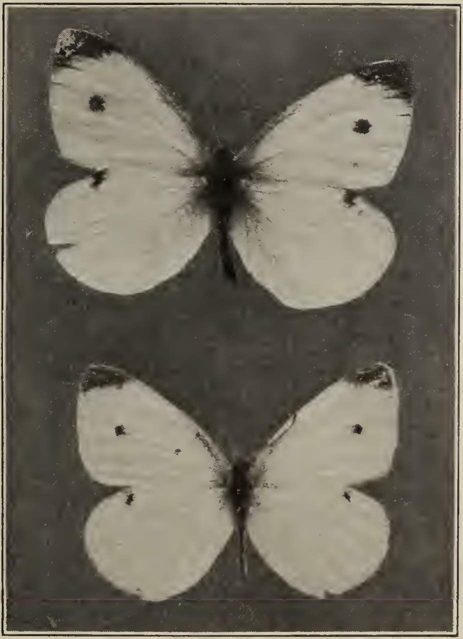


Fig. 31. Adults of the Cabbage Worm—Female above, Male below (original).

Remedies.—A contact spray in the form of an emulsion, or a strong soap solution, or a strong decoction of tobacco, may be used. These may be sprayed upon the trees, or with young trees the affected tips can be dipped into the solution.

THE BAG-WORM.

In Knox, Williamson and Franklin Counties the bag-worm (*Thyridopteryx ephemeraeformis* Haw.) is known to be doing appreciable damage. Doubtless this is more or less true all over the State. It attacks many kinds of trees, but the chief injury is to the evergreen trees and shrubs. The insect eats the leaves, often completely killing the trees. The winter is passed in the egg stage in a pupa inside of the pendulous bag frequently seen hanging on evergreens. In the spring numerous young caterpillars appear from these eggs and begin at once to eat the leaves and build a case, or bag, of silk, twigs and leaves about themselves. In this bag the young live. When they wish to feed or travel they push their heads and legs out of the case. They molt four times, their case being enlarged as they grow. Figures Nos. 28 and 29 show the male and female cases, the latter being somewhat larger than the former. At the end of the male case will be noticed the pupa skin from which the male has emerged. The adult male is shown in Figure No. 28. The female never has wings. Her life is spent in the bag. Here she mates, lays her eggs, and dies. Figure No. 30 shows the bag cut lengthwise exposing pupa in which are the eggs.

Remedies.—While the bag-worm is still young, spray the trees with arsenate of lead at the rate of 2 pounds to 50 gallons of water; do this about the time that growth begins in vegetation. The bags can also be collected from the trees in the winter and burned.

THE IMPORTED CABBAGE WORM.

The light yellow butterfly about 1¼ inch in length seen flitting among the cabbage plants is the adult of the cabbage worm (*Pontia rapae* Linn.). The eggs are laid upon the leaves of the cabbage, or other members of this plant family. They hatch in from 4 to 8 days into velvety green worm-like young. In about 2 weeks they have attained their growth, when they attach themselves to the leaves and become chrysalids, from which the butterfly emerges in a week or two. The chrysalids formed late in the fall pass the winter in this condition, the moths emerging in the early spring. There are at least five generations in Tennessee.

Remedies.—Spraying with arsenate of lead at the rate of 2 pounds to 50 gallons of water is effective when done early. If necessary to use a remedy later, ashes, road dust or air-slacked lime will be found useful.

THE HARLEQUIN CABBAGE BUG.

The Harlequin cabbage bug (*Murgantia histrionica* Hahn.) is one of the worst insect pests to the members of the mustard family, especially cabbage, collards, cauliflower, turnip, radish, mustard, rape, kale, etc. This insect usually occurs in large numbers, and being a sucking insect with a resistant covering to its body it is difficult to combat. Its eggs are laid in two rows on the underside of leaves, stems and seed pods, in groups of 12 or more. In warm weather they hatch in 3 or 4 days. The young bugs go through 5 stages in reaching the adult stage, the number of days required by them to go through these stages varying according to the temperature. Careful study has shown this time to be from 40 to 70 days. It passes the winter in the adult stage, hiding away under trash and debris.

Remedies.—The methods of combating this insect may be summed up under the following heads: clean culture, trap crops and hand picking.

THE CHINCH-BUG.

Some years the chinch-bug (*Blissus leucopterus* Say) causes great injury to the corn, sorghum, wheat and millet crops in this State. This insect winters in the adult stage hid away under rubbish, in grass and debris. It comes out early in the spring and lays its eggs on the roots or stalks of the wheat. In from 2 to 3 weeks these eggs hatch and the young chinch-bugs begin their work in the wheat fields, usually remaining there

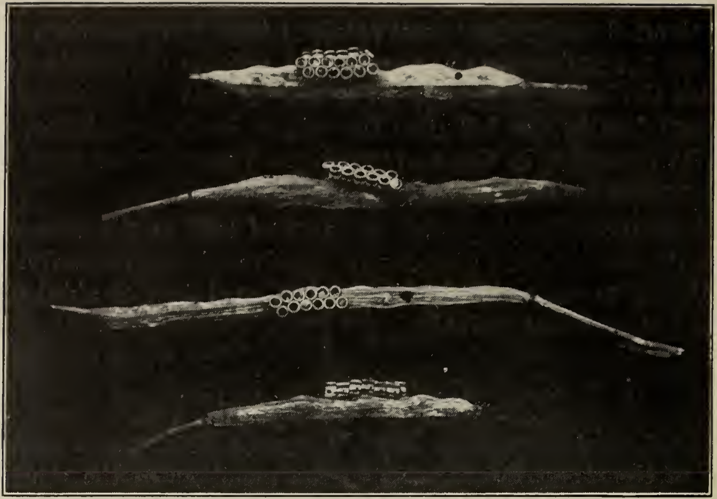


FIG. 32. Egg Clusters of Harlequin Cabbage Bug on Seed Pods of the Radish, Slightly Enlarged (original).

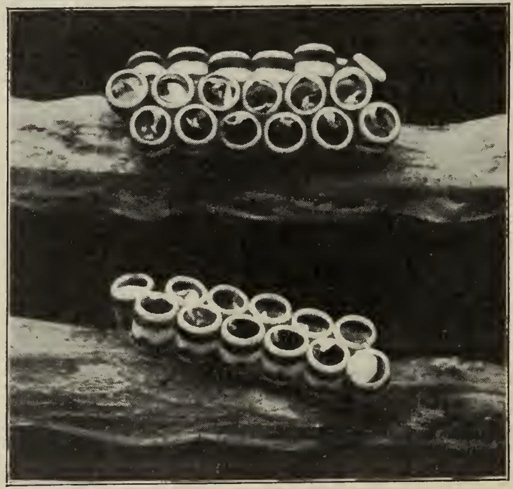


FIG. 33. Egg Clusters of Harlequin Cabbage Bug, Enlarged three times (original).

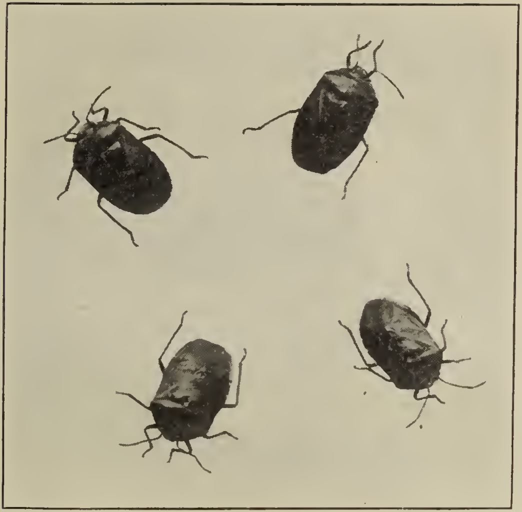


Fig. 34. Adults of Harlequin Cabbage Bug (original).

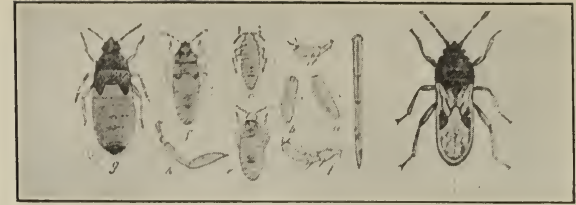


FIG. 35. Showing Life-history of the Chinch-bug Eggs, Nymphs and Adults (after Riley).

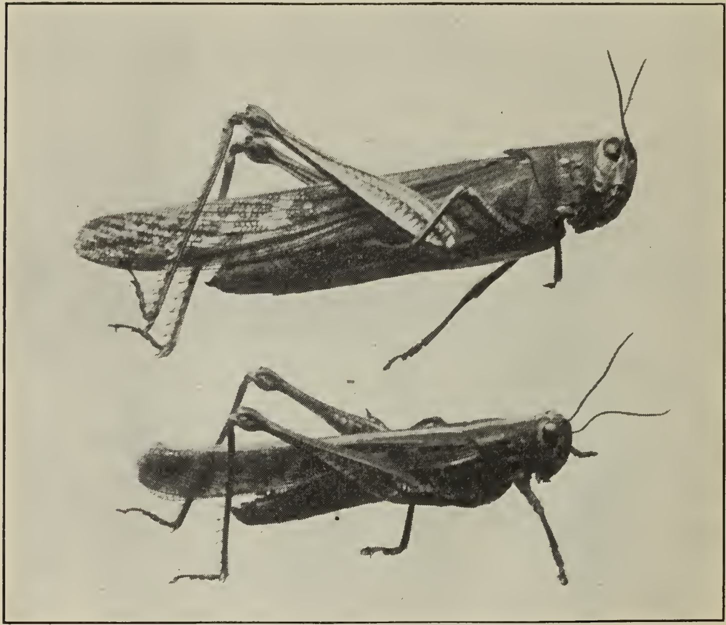


FIG. 36. Adult Female (above) and Male (below) of *Schistocerca americana*, Natural Size (original).

until harvest, when they move on, going to the oats or young corn. After a lapse of about 6 weeks they become adults and pair again to begin the second generation. There is some question as to whether a third generation occurs in this State. This bug is a sucking insect and does damage, in all stages of its life, by sucking the juices from the plant. The plant attacked turns yellow, then withers and dies. The accompanying figures show the different stages of the chinch bug.

Remedies.—Clean culture is the method first to be practiced. Do not leave stalks, leaves, or rubbish in the fall for the adults to pass the winter under. The chinch-bug has fully developed wings but these are used little except while mating. Advantage is taken of this, for when the bugs migrate from one field to another it is well to plow a furrow around the field, having the land side next to the field to be protected. Coal tar in ditches may also be used.

GRASSHOPPERS.

In certain sections of the State the bird grasshopper (*Schistocerca americana* Scud.) has appeared in very large numbers and has caused considerable damage, especially to corn and sorghum. These ravages are increasing and have attracted some attention. This is the largest of the grasshoppers found in the State. When occuring in vast numbers it completely shreds the blades of growing corn and sorghum and causes great injury. This form hatches from the egg in the spring and also in the summer. In protected places it passes the winter in the adult stage.

Remedies.—Since the eggs are in pockets in the ground, plowing is a method for destroying great numbers of these grasshoppers. A poison known as the Criddle mixture may also be used. This latter consists of a mixture of 100 pounds of fresh horse manure, 2 pounds of salt, 1 pound of Paris green or 3 pounds of arsenate of lead. Mix thoroughly with water. Scatter this mixture over the fields a shovelful or two every rod.

LARGER APPROPRIATION NEEDED.

The present appropriation for the State Board of Entomology is $2,000.00 per year. This amount is the same as the initial appropriation made for this Board in 1905, when the work was first begun. Since that time the duties of the Board have expanded along many lines, and instead of the nursery inspection alone there are now many and urgent demands, which may be enumerated as follows:

Investigational work in studying the life-histories and habits of the insect and fungous pests detrimental to the horticultural and agricultural interests of the State.

Co-operative experiments with insecticides and fungicides in different parts of the State for the purpose of assisting the farmer, fruit grower, florist, nurseryman, and in fact all persons in the proper use of the same.

Orchard demonstrations in which the making, applying and selecting of the proper sprays and sprayers may be given before public gatherings in the orchard sections of the State.

Orchard survey of the whole State from which the existing conditions of the orchards would be learned, thus enabling the proper attention to be directed where most needed.

The cotton boll weevil will soon be in the State. The introduction of this destructive insect should be warded off as long as possible. All cotton growers should be given full instructions as to how best to manage their crops with this end in view.

The brown-tail and gypsy moths are foreign pests that have become established in many sections in the eastern portion of the United States, occasioning great loss of shade and ornamental trees and depreciation in the value of real estate, due to complete defoliation of trees and shrubs together with annoyance to the people caused by the barbed penetrating hairs shed by the caterpillars, which cause serious irritations of the skin.

Inspection of foreign nursery stock is necessary. The nests of the brown-tail moth on foreign nursery stock are being sent to Tennessee each year. With the present appropriation this inspection of foreign nursery stock cannot be properly made, economically for the nurserymen.

Peach yellows occurs in the State. At present, however, its distribution is not known. A careful investigation of the occurrence of this destructive peach tree disease and methods for its eradication are very important. The fact that this disease is known to occur in the State causes heavy losses to the nurserymen; for many States will not permit Tennessee-grown stock to come into their borders because peach yellows is found here. This disease may occur only in limited areas or in sections where it might soon be destroyed.

The correspondence that comes to this office from farmers and others interested in all phases of outdoor life is very heavy and at present much of the time of the State Entomologist has to be devoted to the writing of replies to these letters. The Board is very greatly in need of a stenographer, whose services could be profitably employed for writing and filing letters, and doing the large amount of clerical work necessarily connected with the office. At the present time the usefulness and the extent of the work accomplished are materially interfered with, due to its being impossible for the Entomologist to be out of the office more than a day or two at a time.

An assistant entomologist is needed. There are urgent demands for investigations and inspections and special calls for the services of an entomologist, and with the present duties incumbent upon the State Entomologist, it is impossible to respond to these demands. The work of the Board has increased and extended into new lines and the services of a regular assistant are needed throughout the year. At the present time two assistant nursery inspectors are employed for two months during the summer inspection season. With the services of a regular assistant for the year this inspection work could be made later and done more thoroughly. The assistant would be able to inspect all shipments coming to the State from sections where San Jose scale, crown gall and wolly aphis are prevalent. The chief advantage of having another person actively employed in the work is that either the Entomologist or his assistant would be free to leave the office for the purpose of making investigations, taking part in farmers' institutes, overseeing the cooperative experiments, adding to the State collection of insects and conducting the orchard demonstration work in different parts of the State.

The publication of bulletins and circulars on economic insects and methods for their control has been reduced to the minimum due to the little money for this purpose. This year the Annual

Report is the only publication that can be issued by the Board, while there is material on subjects both timely and practical that should be printed and generally distributed. Several hundred bulletins and reports, wrapped and addressed, remain in the office for the want of postage for mailing.

The traveling expenses necessitated by the regular annual nursery inspection are large, as the 242 nursesries are scattered all over the State, from Bristol to Memphis. No assistance has been rendered for the past two years in the way of passes on the railroads; thus traveling has been one of the largest items of expense.

The duties now incumbent upon the Board are fully eight times as great as they were when the work began and are rapidly increasing. At least $10,000 per annum are now needed to meet the present urgent demands. In the interests of the truckers, fruit growers, florists, nurserymen and farmers of this State, the Board respectfully suggests that the Legislature of 1911 be requested to increase the annual appropriation for the State Board of Entomology so that the present work can be carried on and the many urgent problems facing the farmers and fruit growers may be investigated.

Law and Amended Rules and Regulations

Law

AN ACT to create a State Entomologist and Plant Pathologist; to provide quarantine rules and other rules and regulations regarding the sale, transportation, and delivery of trees, shrubs, vines, plants or plant products so as to prevent the dissemination of injurious insect pests, also to amend said Acts so as to make it unlawful for any person, firm or corporation to knowingly grow, sell, offer for sale, or give away, transport, keep or permit to be kept, any plants, trees, shrubs, vines, or any part of a plant infested with injurious insects, insect pests, and contagious plant diseases, and to otherwise provide for the duties and powers of said State Entomologist and Plant Pathologist, and to regulate the sale and transportation and inspection of trees, roots, bulbs, plants, and plant products.

Approved April 17, 1905.

Section 1. *Be it enacted by the General Assembly of the State of Tennessee*, That it shall be unlawful for any person, firm, or corporation knowingly to grow, sell, offer for sale, give away, transport, keep or permit to be kept upon his or their premises any plants, trees, shrubs, vines, or any part of a plant infested with injurious insect pests and contagious plant diseases.

COMMISSIONER OF AGRICULTURE TO APPOINT.

Sec. 2. *Be it further enacted*, That within thirty days after the passage of this Act the Commissioner of Agriculture shall appoint a competent Entomologist and Plant Pathologist, subject to the approval of the Governor, and necessary assistants, who shall, under the authority of said Commissioner, be charged with the duty of inspecting trees, vines, shrubs, plants, or any part thereof as prescribed in this Act.

THE BOARD AND ITS POWERS.

Sec. 3. *Be it further enacted*, That the Commissioner of Agriculture and said State Entomologist and Plant Pathologist, who shall constitute and be designated as the "State Board of Entomology," shall have plenary power to enact such rules and regulations for the enforcement of the provisions of this Act as may be necessary fo prevent, control, and eradicate the further introduction, increase, and dissemination of insect pests and fungous diseases, which otherwise would threaten the fruit and other agricultural interests of the State.

DUTIES OF ENTOMOLOGIST.

Sec. 4. *Be it further enacted*, That it shall be the duty of the State Entomologist and Plant Pathologist, or his assistants, to inspect annually, or oftener, if necessary, all greenhouses and nursery stock grown within the bounds of the State prior to September 1st of each year, and he or they shall issue a certificate of freedom from insect pests and plant diseases to the owner or lessee of any greenhouse or nursery, or other persons who give away, sell, or transport nursery stock, found entitled to the same. All certificates of inspection shall be given not later than November 1st of each year, and shall become void after August 1st of the year following. A duplicate copy of each certificate shall be filed by the State Entomologist and Plant Pathologist with the Commissioner of Agriculture not later than thirty (30) days from the time of issue.

VISITATIONS TO BE MADE.

Sec. 5. *Be it further enacted*, That it shall be lawful for the State Entomologist and Plant Pathologist, acting under the authority of the State Board of Entomology, or his assistants or authorized agents, to visit any section of the State and examine any or all fruit-bearing, ornamental, or shade trees, or any field truck crop or garden crops, or any plants or parts thereof, of any description whatsoever, and determine whether infectious diseases exist or not. If discovery is made of injurious insect pests or fungous diseases, a report in writing of such finding shall be made to the owner of the infested plantation, his agents or tenants, and a copy of such report shall be filed with the State Board of Entomology. If any objections are made against the findings of the State Entomologist and Plant Pathologist, or any of his authorized assistants, such objections must be made in writing within (10) ten days of the finding, to the said Board, who shall have power to summon witnesses and hear testimony on oath, and whose decision shall be final. Any person or persons who shall interfere with the duties of said Entomologist and said Board, as prescribed in this section, shall be considered guilty of a misdemeanor, and he or they shall be fined not less than twenty-five ($25) dollars, nor more than fifty ($50) dollars for each offence.

AS TO TREATMENT OF INFESTED STOCK.

SEC. 6. *Be it further enacted*, That upon discovery by the State Entomologist and Plant Pathologist of dangerous insect pests and fungous diseases, whether in greenhouses and nurseries or in public or private domain, the treatment prescribed by the State Entomologist and Plant Pathologist shall be executed at once (provided there is no appeal), and under his supervision. If the case in question is worthy of remedial treatment, the cost of the material and the labor shall be borne by the owner. In case infected stock is not worthy of remedial treatment, such infectious plants shall be placed under the jurisdiction of the Board of Control.

WHEN NURSERY STOCK CAN NOT BE SHIPPED.

SEC. 7. *Be it further enacted*, That it shall be unlawful for any grower, nurseryman, florist, dealer, or corporation to ship, sell, or deliver within the State any trees or plants of whatever description without having been previously inspected by the State Entomologist and Plant Pathologist, or his authorized assistants and a certificate placed upon each bundle, package, bale, box or car load of shipment.

PENALTY.

Any violation of said certificate by changing, defacing, or placing it on uninspected or infested stock, or using the same after date of expiration or revocation, shall render the owner or shipper liable to a fine of not less than one hundred ($100) dollars nor more than one hundred and fifty ($150) dollars for each offense; *Provided*, that the provisions of this Act shall not apply to farmers or small growers who may sell plants, flowers, or shrubs in their own counties.

NURSERYMEN TO REGISTER THEIR NAMES.

Sec. 8. *Be it further enacted*, That each and every individual, firm, or corporation residing in other States, Territories, Provinces, etc., dealing in or handling trees, plants, vines, shrubs, bulbs, roots, cuttings, etc., before shipping into the State, shall register his name, firm, or corporation, and file a copy of his or its certificate of inspection, furnished by the Entomologist, fruit inspector, or duly authorized Government official of his State, county, or province, with the Secretary of the State Board of Entomology. All packages, boxes, bales, car loads of plants, commonly known as greenhouse or nursery stock, imported into the State shall be plainly labeled on the outside with the names of the consignor and consignee, and a certificate showing that the said contents had been inspected by a reputable State or Government official. Upon the failure of any person or persons to subscribe to the declarations set forth in this section, said stock shall be confiscated under the order of the State Entomologist and Plant Pathologist.

AS TO QUARANTINE REGULATIONS.

Sec. 9. *Be it further enacted*, That the Tennessee State Board of Entomology shall have the power to adopt such quarantine rules and other regulations, not inconsistent with the Constitution of the State and the United States, as they may deem necessary to prevent the introduction of dangerously injurious fruit or crop pests, or diseases from without the State, and to govern common carriers in transporting shipments liable to harbor such pests or diseases to or from the State, and such regulations shall have the force of law.

PENALTY.

Sec. 10. *Be it further enacted*, That any agent, common carrier, railroad, steamboat, or express company found delivering within the bounds of the State any plants, trees, shrubs, vines, cuttings, bulbs, roots, etc., under conditions otherwise than that provided in this Act, shall be found guilty of misdemeanor and fined not less than twenty-five ($25) dollars nor more than fifty ($50) dollars for the first offense, and one hundred ($100) dollars for each offense thereafter.

FUMIGATION OF NURSERY STOCK.

SEC. 11. *Be it further enacted*, That all nursery stock sold, shipped, or delivered within this State or shipped into this State from other States shall be treated or fumigated as may be required by the regulations of the Tennessee State Board of Entomology hereinbefore provided for.

TREATMENT OF INFECTIOUS DISTRICTS.

SEC. 12. *Be it further enacted*, That upon knowledge coming from any county within the State to the Board of Control that noxious insect pests or plant diseases exist in said county, or in close proximity in an adjoining county, the State Entomologist and Plant Pathologist shall be empowered by said Board to investigate as speedily as possible the supposed infectious district; and if, upon examination, dangerous insect pests or infectious plant diseases are disclosed, such infested premises shall be treated in accordance with this Act, as prescribed in Sections 5 and 6.

REPORTS OF STATE ENTOMOLOGIST.

SEC. 13. *Be it further enacted*, That the State Entomologist and Plant Pathologist shall submit to the State Board of Entomology a monthly report of work done; he shall also submit an annual report on or before the first of February of each year to the Governor of the State, embracing a review of inspections and investigations made and the condition of the State relative to insect pests and plant diseases, which shall be published as are other State reports, for general distribution.

APPROPRIATION.

SEC. 14. *Be it further enacted*, That the sum of two-thousand ($2,000) dollars annually be, and is hereby, appropriated to the State Board of Entomology in order to carry out the provisions of this Act—namely, to employ a competent State Entomologist and Plant Pathologist; to procure the requisite facilities and equipment necessary for the proper discharge of duties herein incurred; to support a reasonable amount of investigation in addition to the inspection work of the State; and to publish the results of observations and investigations made in bulletin form, which may disseminate information that will prove useful to the agricultural and horticultural interests of the State.

COMPTROLLER TO DRAW WARRANT.

SEC. 15. *Be it further enacted*, That the Compotroller of the State be, and is hereby, authorized to issue his warrant upon the State Treasurer for the sum of two thousand ($2,000) dollars annually out of any funds not otherwise appropriated; that said sum of money shall be made payable quarterly to the State Board of Entomology and only upon the presentation of proper vouchers.

RULES MAY BE ADOPTED BY STATE BOARD OF ENTOMOLOGY.

SEC. 16. *Be it further enacted*, That the State Board of Entomology shall have power to adopt such rules and regulations governing insect and plant pests within the bounds of the State, as are not inconsistent with the Constitution of the State and the United States; that said Board shall, within sixty (60) days from the passage of this Act, draft and publish through the State press all rules and regulations necessary to carry into full and complete effect the embodiment of this Act, cautiously and wisely, outlining the diseases and maladies caused by both insect and fungus, and explaining what constitutes infectious plant diseases in the eyes of the law.

SEC. 17. *Be it further enacted*, That this Act shall take effect from and after its passage, the public welfare requiring it; and that all laws or parts of laws in conflict with this Act are hereby repealed.

Rules and Regulations of the State Board of Entomology

In compliance with the requirements of an Act of the General Assembly of the State of Tennessee (S. B. No. 442, Chap. 466), approved April 17, 1905, entitled "An Act to Create a State Entomologist and Plant Pathologist," etc., the State Board of Entomology, established by said Act, announces the following Rules and Regulations. These Rules and Regulations are subject to revision and change, without notice, as experience may warrant. It should be understood that the State Board of Entomology, in undertaking the work entrusted to it by law, is inspired with the purpose of aiding in every legitimate way the business interests primarily involved. The rules herein promulgated have been adopted after a careful consideration of the regulations of adjoining States governing nursery and greenhouse inspection, and it is believed that they are not more burdensome than the ends in view demand:

1. The following insects and fungous diseases are declared to constitute infestation in trees and plants:

San Jose scale (*Aspidiotus perniciosus*).
West Indian peach scale (*Aulacaspis pentagona*).
Woolly aphis of apply (*Schizoneura lanigera*).
Mexican cotton boll weevil (*Anthonomus grandis*).
Gypsy moth (*Porthetria dispar*).
Brown-tail moth (*Euproctis chrysorrhoea*).
Black knot of cherry and plum (*Plowrightia morbosa*).
Crown gall.
Rosette of peach and plum.
Yellows of peach.

2. Every person, firm, or corporation desiring to conduct the business of a nursery or to sell fruit and ornamental trees and plants, commonly known as nursery stock, shall apply to the State Entomologist, Knoxville, Tenn., on or before July 1 of each year for inspection of their nursery stock; and they shall inform the State Entomologist of the location of the nursery

or nursery stock to be inspected, its acreage, extent and amount, so that arrangements can be made for the prompt inspection.

3. Nursery stock is construed to include all fruit, shade, ornamental, and nut trees, bush fruits, grapevines, and strawberry plants, and all buds, grafts, scions, and cuttings from same.

4. *In accordance with Section II of the Law, all trees, buds, grafts, scions, or cuttings of apple, apricot, cherry, peach, pear, plum, and quince, which shall be sold in the State of Tennessee shall be fumigated immediately before shipment or delivery, with hydrocyanic acid gas.*

At the time of the nursery inspection the fumigating house or box shall also be inspected and must be found in a satisfactory condition; otherwise no certificate can be granted.

5. No person, firm or corporation shall sell, offer for sale, exchange, barter, or give away any nursery stock grown within the State of Tennessee, unless in possession of a valid certificate of inspection previously obtained from the State Board of Entomology.

6. The State Entomologist, or his assistants, shall, on or before November 1 of each year, inspect all nurseries and nursery stock within the State, and if found free of infestation a certificate of inspection shall be issued, covering same, good until August 1 of the year following.

7. If infestation is found in any nursery, greenhouse, or nursery stock, the certificate shall be withheld until the premises have been so treated that the salable stock to be covered by said certificate shall be free from such infestation; and such treatment shall be prescribed by the entomologist making the inspection.

In case part of a nursery shall be found infested, no certificate shall be granted, but isolated blocks of nursery stock not infested may be considered as separate nurseries, and a certificate covering such stock may be issued after all the infested blocks have been treated as ordered by the inspector. If in the judgement of the inspector infested stock is in so bad a condition as to be unworthy of remedial treatment, it shall be destroyed, subject to appeal as provided by law.

8. On complaint to the State Entomologist by any citizen that infestation exists in any orchard, garden, or other grounds, said grounds shall be inspected by the Entomologist or his assistant. If the infested plants can be saved by remedial action, the inspector shall prescribe treatment, but if the infestation is so great that, in the judgment of the inspector, the plants are not worth treatment, they shall be destroyed at the expense of the owner. Appeal can be made to the State Board of Entomology, as provided by law.

9. Every car-load, box, bale, package, or delivery of nursery stock which is sold, exchanged, etc., by any person, firm or corporation within the State of Tennessee, shall be accompanied by a copy of the certificate of inspection, conspicuously and securely attached. *This means that every individual sale or bill of trees shall bear a copy of the certificate.* Any nursery stock not thus marked is liable to be destroyed without compensation to the consignor, who is further liable to a fine of not less than $100.00. No transportation company, or agent thereof, may accept for shipment any nursery stock not accompanied by a copy of certificate of inspection.

10. Any person, firm or corporation without the State of Tennessee, desiring to do business within this State, shall file with the State Entomologist (who is also Secretary of the Board), Knoxville, Tenn., a copy of his certificate of inspection, issued by the proper official of his State. And every shipment of nursery stock into the State of Tennessee must be accompanied by a copy of such certificate of inspection.

11. Shipments of nursery stock not properly labeled shall be refused for shipment by all common carriers and their agents. Transportation companies and their agents shall immediately notify the State Entomologist and Plant Pathologist, Knoxville, Tenn., when by oversight, negligence or otherwise any shipment of nursery stock without a proper certificate attached shall arrive at any station or wharf in this State, and it shall be the duty of the Entomologist and Plant Pathologist or his assistant as speedily as possible to investigate and dispose of such shipment.

12. In accordance with Section 9 of the Law, and in order to prevent the importation of the Mexican cotton boll weevil into Tennessee from the infested areas of Texas, Oklahoma, Louisiana, Arkansas and Mississippi, a quarantine is hereby declared against the infested areas.

(*a*) No cotton lint (loose, baled, flat, or compressed), cotton seed, seed cotton, cotton-seed hulls, seed-cotton or cotton-seed sacks (which have been used), or corn in the shuck, shall be shipped into Tennessee from the infested territory of Texas, Oklahoma, Louisiana, Arkansas and Mississippi.

(*b*) Shipments of household goods from infested areas of above named States shall not be admitted into Tennessee unless accompanied by an affidavit attached to the waybill to the effect that the shipment contains no cotton lint, cotton seed, seed cotton, cotton-seed hulls, seed-cotton or cotton-seed sacks, or corn in the shuck.

(*c*) It shall be unlawful for anyone in Tennessee to have in his possession live Mexican cotton boll weevils. The public is urged to recognize the danger of introducing unwittingly live boll weevils for inspection, observation, or experiment.

NOTICE.

The following bulletins have been issued by the Tennessee State Board of Entomology and copies will be gladly mailed to anyone writing for the same. Address Tennessee State Board of Entomology, Knoxville, Tenn.

Bulletin No. 1, Law Creating the Tennessee State Board of Entomology—Rules and Regulations.

Bulletin No. 2. The Fumigation of Nursery Stock—Law and Amended Rules and Regulations.

Bulletin No. 3. The Control of Insects, Fungi and Other Pests.

Bulletin No. 4. The San Jose and Other Injurious Scale Insects of Tennessee, with Methods for Their Control.

Bulletin No. 5. Orchard Management in Tennessee.

First Annual Report of the State Entomologist and Plant Pathologist, 1905.

Second Annual Report, 1906.

Third Annual Report, 1907.

Fourth Annual Report, 1908.

Fifth Annual Report, 1909.

SUGGESTIONS ON MAILING SPECIMENS.

Questions pertaining to insects and plant diseases will be gladly answered. All requests should be accompanied by specimens. These should be sent, not in a letter, but in a tight tin or wooden box with no openings, addressed to the State Board of Entomology, University of Tennessee, Knoxville, Tenn. If possible, send some of the food of the insects, together with their work. Wrap all neatly, placing your own name upon the package. In a letter tell all you have noticed about the insect, as to its food, its first appearance, abundance, extent of injury, etc.

A collection of the insects of this State is being made, and any assistance in adding to this collection will be greatly appreciated.